J. G. Gartside
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PARALLEL PATHS

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A STUDY IN BIOLOGY, ETHICS, AND ART

BY

T. W. ROLLESTON

"Il faudrait, en un mot, suivre la grande route si profondément creusée . . . mais il serait nécessaire aussi de tracer en l'air un chemin parallele, une autre route, d'atteindre les en deça et les après, de faire, en un mot, un naturalisme spiritualiste ; ce serait autrement fier, autrement complet, autrement fort."

J. K. HUYSMANS.

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PREFACE

IN a recent work by an eminent man of science, Dr. J. Reinke, Professor of Botany at the University of Kiel, there occurs a passage which I cannot do better than place in the forefront of this book as an indication of its aim.

"Physiology," writes Professor Reinke, "has become the study of the movements which, taken together, make up life. There is no manner of doubt that nourishment, metabolism,[1] reproduction, development, and sensation rest on processes of movement which depend on material systems of peculiar molecular conformation. For the bodies of plants and of animals are material systems whose conformation is of a most intricate character.

"So far as physiology has at present advanced in the analysis of these phenomena of movement, their problems have fallen naturally into two groups. The first of these groups of phenomena is comparatively transparent, and stands in agreement with the general processes of the material world; it can be investigated by observation and experiment. We may, therefore, hope to decipher it completely, and to reduce it, in the end, to chemico-physical processes. Of this kind are the phenomena of nutrition, taking that word in its widest sense. But behind these

[1] Metabolism: see p. 27.

processes there stand the facts of development and of reproduction, and here, in all investigations, and in spite of every attempt to demonstrate a basis of physical energy, research finds itself confronted by an *X*, a factor which mocks every effort to explain it by physics or chemistry. And this *X* which lurks in all the phenomena of development takes a part in the nutritive processes also; so essential a factor does it appear in all the processes of life that chemical and physical forces alone would not suffice to keep alive even the most rudimentary of organisms, not to mention creating such an organism out of non-living chemical constituents."[1]

If this *X* force exists and can be established, it will give us the clue, I believe, to much more than the operations of physical nature. The following pages are an attempt to establish it, to define its character, and to indicate the lines on which this unknown factor in evolution seems to bring into a rational unity the phenomena of the physical world and the moral and æsthetic faculties of man. The time appears to have come for such an attempt. The fermentation of mind produced by Darwin's massive and victorious promulgation of the evolution theory is beginning to subside; it is now possible in some measure to take stock of what has been destroyed, of what has been left intact, by the immense tidal wave

[1] J. Reinke. DIE WELT ALS TAT, p. 173. The term 'development' (*Entwicklung*) includes both what we commonly understand by that term (as, the transformation of an embryo into a complete animal) and also what we call Evolution, the development of one species into another.

of new thought which then swept over the world. Some conceptions which were thought to have been submerged for ever are reappearing in more or less altered shapes, and science is called on to reconstruct a universe less one-sided, less aridly simple, than that which Darwinism, as at first understood, appeared to have left us. The result, so far as it is successful, will be the establishment of a spiritual view of the universe on a natural basis. It is an attempt which is at present occupying many minds, and which will doubtless have to occupy many more before complete success is attained.

I propose, in the following pages, to take the reader over the most material and significant part of the ground by which I have myself travelled towards certain conclusions. Much of this ground lies in the region of biological science. No doubt to readers acquainted with that science I shall often seem to delay too long in well-trodden and familiar paths. But I have had to consider the fact that English education is still very much specialized. It is either literary or it is scientific. In the great majority of cases it is literary. And though scientific problems and theories are understood by every educated man and woman to be of deep importance and interest, and though questions like those discussed in the present work are questions on which all such persons are well entitled, and many feel themselves bound, to have an opinion, very few, comparatively, have even

the elementary knowledge of science and its terminology necessary to enable them to take up the discussion at an advanced point. When it is announced from time to time that some chemist has again succeeded in forming an organic compound out of inorganic chemical constituents in his laboratory,[1] how many readers are there out of the small circle of trained chemists who would not be far more impressed if they heard that he had made a diamond? It is for these persons—the layman and the laywoman in point of science—that I mainly write, and my own training having been philosophical and literary rather than scientific I think I understand most of their difficulties. I have, therefore, tried to 'begin at the beginning'; and I hope that this book, besides whatever value its conclusions may have, will prove useful to some readers by putting them in a position to appreciate the extraordinarily interesting and fruitful discoveries of biology in recent years.

"The lotus of physics," as Schopenhauer says, "is rooted in the soil of metaphysics," and if these studies pretended to offer a complete explanation of the riddle of existence, the metaphysical basis for the speculations contained in them would have to be elaborated at considerable length. But, after all, the conclusions reached would only be those which most people are willing to accept as a necessary assumption, if all thought on the constitution of the universe

[1] See p. 24.

is not to be a pure futility. Suffice it to say Man is here regarded as an organic part of Nature, and his consciousness as Nature's way of mirroring herself to herself. Since, like other natural things, the soul is not a complete and unalterable entity, but is part of the eternal Becoming, it never can be claimed that its reflection of the world is absolutely pure and complete, yet some reality, some significance this reflection must surely have. The fact that man is not something different from the world, observing it from outside, but is vitally related to it, would alone entitle us to believe that, however much his observations may need to be purified and corrected, and however false may be the argumentative deductions sometimes drawn from them, he is still capable of a real and fruitful apprehension of the phenomena by which he is surrounded, and of their relations to each other and to himself. All sincere thought must therefore tend to brighten a little the mirror of the human soul. If this book should do so in any degree, were it merely by provoking other minds to more successful labours, the writer will thankfully say, like Apollo's temple-sweeper in the play of Euripides, Fair is the service of Light.

T. W. ROLLESTON.

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I have to thank The Macmillan Co. for permission to reproduce two illustrations (Figs. 1 *and* 2) *from Wilson's* THE CELL IN DEVELOPMENT AND INHERITANCE, *and Mr. Edward Arnold for a similar favour in regard to Fig.* 3 *from Weismann's* THE EVOLUTION THEORY.

CONTENTS

PART I. BIOLOGY

CHAPTER I

The Argument from Design

CHAPTER II

The Wheel of Life

CHAPTER III

De Minimis

CHAPTER IV

The Mechanical Theory of Evolution: the Darwin-Lamarck Explanation

CHAPTER V

The Mechanical Theory of Evolution: the Darwin-Weismann Explanation

CHAPTER VI

The Directive Theory of Evolution

PART II. ETHICS

CHAPTER VII

Law, Free Will, Personality

CHAPTER VIII

The Ethical Criterion

CHAPTER IX

The Ethical Sanction

PART III. ART

CHAPTER X

Art and Life

PARALLEL PATHS

PART I: BIOLOGY

CHAPTER I

THE ARGUMENT FROM DESIGN

"The wisdom of the divine rule is apparent not in the perfection but in the improvement of the world."—LORD ACTON.

PALEY'S NATURAL THEOLOGY though not by any means an epoch-making may perhaps be called an epoch-marking book. It was the crown of the endeavour of eighteenth-century religious philosophy to found a theology on the evidences of external nature. According to such exact knowledge of Nature's operations as was then generally available, Paley's attempt might well be thought to have succeeded. He opens his argument with a striking and effective illustration. He imagines a wayfarer crossing a heath who strikes his foot against a stone, and who asks himself how it came into being. Paley thinks he might be content with vaguely supposing that it was there 'always.' But suppose that what he had found at his foot was not a stone but a watch and that he now saw such an instrument

for the first time. He would then certainly have not been so easily contented with an answer to the riddle of its existence. He would, if he examined it minutely, have observed that it was a structure intended for a certain purpose, and having all its parts arranged for that object, and mutually inter-dependent. The different substances of which it was composed would be discovered to have each its special appropriateness for the fulfilling of some particular function in the economy of the whole. Though unacquainted with watches he would, if he was a man of sense and cultivation, infallibly conclude that he had before him an instrument intelligently constructed with a certain object in view—the object of measuring the flight of time. He would feel assured of this, even though he should find that the object of the mechanism were not attained with absolute accuracy, and even though there were some parts of it whose functions were not clear to him. The watch would be rightly regarded as a work of design; and the observer would be justified in arguing from it to the existence of a designer, endowed with the faculties of intelligence and conscious purpose, by whom the watch must have been put together.

The rest of Paley's NATURAL THEOLOGY is an application of this analogy to the question of the origin of the universe. Ranging over the whole field of animate and inanimate nature he points to instance after instance of what appears to be the

minute and thoughtful adaptation of means to ends, the co-ordination of part with part in the interest of the whole, and he has no difficulty, from this point of view, in showing the world of nature to be a piece of mechanism far more wonderfully and ingeniously constructed than any watch, and bearing *prima facie* evidence of the most convincing kind of its construction by a Being possessed of intelligence, purpose and foresight precisely resembling those attributes as displayed by man, but vastly heightened and enlarged. As the watch must have been made by man, so a manlike being, endowed with the necessary powers and faculties, must be postulated as the maker of the material universe. And thus the existence of a God made in the image of man appeared to have been demonstrated to the satisfaction of eighteenth-century theology.

But minds of real philosophic depth have always shrunk from pressing home deductions of this sort. They have felt that the matter is probably not quite so simple as it might appear on the surface, and they have recognised that if one is allowed to argue from the phenomena of nature to the qualities of the author of nature one cannot draw an arbitrary line including only those facts which testify to wisdom, power and goodness, and excluding from view all those which reveal imperfection of design and execution, or which would convict a man, if he were their author, of inhumanity and injustice. If the universe

is really analogous to a watch one is entitled to examine it throughout as one would examine a watch. All watches testify to intelligence and design, but besides good watches there are bad ones, there are those which are made of cheap materials, rudely put together, with showy exteriors and unreliable works. Every watch, if examined by experts in mechanism, in art, and so forth, would reveal the characteristics of its designer and maker, and these characteristics would not always be admirable. They would rarely, in fact, be altogether admirable. If we apply these methods of inquiry to a universe which contains malarial mosquitoes, slave-making ants, snakes, earthquakes, and all the pests which blight and deform life without calling forth any strong or noble qualities to carry on the contest with them, we shall go where Paley certainly never intended to lead us, but we shall go there by Paley's road. The fact is that these methods are altogether fantastic and inapplicable. The universe is not made like a watch. When we observe a human being or one of the higher animals we say, 'He has such and such qualities; he is faithful, false, brave, cowardly, diligent, indolent, strong, weak, beautiful or ugly,' but we do not think of referring his qualities back to certain attributes of an unknown maker of his physical and mental organism. A philosophy worthy of the name has always tended to regard the world as in some sense a vital organism, and has asked 'What is it?' rather

than 'What does it prove about some other being?' "How green must be the maker of all grass" was quite a legitimate satire on all such attempts to deduce the qualities of a hypothetical creator from the phenomena of the universe. Thus the mistake of Paley and his school was fundamental. It was the mistake of seeking God in fragmentary phenomena —the same mistake, essentially, as that rebuked by Christ, by which every calamity or material blessing is regarded as a 'judgment' or a reward. His method, if applied with thorough-going consistency, destroys its own basis, for the One and the Many, the Whole and the Parts, cannot be apprehended at one and the same time by one and the same faculty of any human mind. Looking at phenomena alone, and thinking in that sphere, we cannot say that God made the world but rather that the world is becoming divine. Philosophically and religiously, God is all in all—historically, He is not the beginning, He is rather the end, the end in which the whole history is resumed.

Paley's elaborate argument was felt by the orthodox of his time to be called for, even though at this period his way of thinking was popular. The conception of the world as a vital organism was as yet, indeed, very vague, and unsupported by any detailed, scientific scrutiny of the facts of nature, but it was in the air—it had always been in the air; it always held

the minds of cautious students back from a complete surrender to the facile but illusory way of thinking typified by Paley's famous analogy of the universe and the watch. Bacon knew that species could be transformed by the action of a new environment.[1] Goethe had a clear conception of the evolution theory, based on a study of organic structure. Erasmus Darwin, in 1794, had uttered the great and final word: "The world has been generated rather than created."[2] Lamarck's PHILOSOPHIE ZOOLOGIQUE was not published till 1809, nine years after Paley's NATURAL THEOLOGY, but his conception of the development of special characteristics by habitual exercise and their transmission by inheritance had been freely mooted in Paley's day, for Paley frequently takes occasion to combat it. Even the conception of natural selection as an agency in the formation of types of being may be traced in a fantastic form as far back as to Empedocles,[3] while Plato, or whoever composed a striking couplet attributed to him in the Greek Anthology, had divined the plasticity of natural forms. "Time," he wrote, "sways the whole

[1] SYLVA SYLVARUM, Century VI.

[2] ZOONOMIA, Vol. II, p. 247, third edition, 1801. Darwin is here adopting David Hume's conjecture, which is worked out in some detail in the ZOONOMIA, the conclusion being that probably "one and the same kind of living filaments is and has been the cause of all organic life" (p. 244). He attributed evolution to internal forces impressed on living matter by the Creator.

[3] He taught that nature had produced a multitude of disconnected parts which afterwards combined and recombined at random until the appropriate parts had come together and remained stable.

world; time has power in its prolonged lapse to change the names and shapes, the nature and the destiny of things."[1]

Fifty years after the appearance of Paley's work, the grandson of Erasmus Darwin wrote 'No thoroughfare' on the entrance to Paley's line of speculation, and closed it to mankind for ever. He did this in two ways—first by marshalling from his studies of comparative anatomy and of embryology an extraordinary volume of convincing evidence for the *fact* of the mutability of natural forms, and secondly by his attempt to establish a plausible *method* by which the change and development of organs and types might actually have taken place. The method, summed up in the phrases 'natural selection' and 'survival of the fittest,' was what really caught the attention of the world, and gave his doctrine the wings which carried it into almost every sphere of human thought. However we take it, it was certainly an immense contribution to the organization of knowledge, but whether it is really what it first seemed to be, the basic fact at the bottom of all the phenomena of evolution, is coming to look more and more doubtful in the light of later researches.[2]

[1] *Αἰὼν πάντα φέρει. δολιχὸς χρόνος οἶδεν ἀμείβειν*
Οὔνομα καὶ μορφὴν καὶ φύσιν ἠδὲ τύχην.
Jac. Anth., II, 20.

[2] "It has lately become the fashion, at least among the younger school of biologists, to attach small value to natural selection, if not, indeed, to regard it as a superseded formula." (A. Weismann, The Evolution Theory, Engl. trans., II, 391.)

This question will have to be considered later on in the course of this study, and in relation to its main inquiry, which is this: What precisely was the change in philosophic and religious outlook brought about by the full and final establishment of the doctrine of evolution? Where has evolution left the argument from design? Must we study nature as a mass of unrelated phenomena, or can we discern, through these, any fundamental unity to which they stand in organic relation; and if we can, what is the nature of this unity?

It will be useful in the first place to have before us a typical specimen of Paley's method. I shall choose as an example the case which he considered so striking that he deemed it almost sufficient in itself to bear the whole weight of his argument. In his ninth chapter, 'On the Muscles,' he writes:—

"The next circumstance which I shall mention under this head of muscular arrangement is so decisive a mark of intention, that it always appeared to me to supersede, in some measure, the necessity of seeking for any other observation upon the subject; and that circumstance is, the tendons which pass from the leg to the foot being bound down by a ligament to the ankle. The foot is placed at a considerable angle with the leg. It is manifest, therefore, that flexible strings, passing along the interior of the angle, if left to themselves, would, when stretched, start from it.

The obvious preventive is to tie them down. And this is done, in fact. Across the instep, or rather just above it, the anatomist finds a strong ligament, *under* which the tendons pass to the foot. The effect of the ligament as a bandage can be made evident to the senses; for if it be cut, the tendons start up. The simplicity, yet the clearness of this contrivance, its exact resemblance to established resources of art, place it amongst the most indubitable manifestations of design with which we are acquainted.

"There is also a further use to be made of the present example, and that is, as it precisely contradicts the opinion that the parts of animals may have been formed by what is called *appetency*, *i.e.* endeavour perpetuated and imperceptibly working its effect through an incalculable series of generations. We have here no endeavour but the reverse of it—a constant renitency and reluctance. The endeavour is all the other way. The pressure of the ligament constrains the tendons; the tendons react upon the pressure of the ligament. It is impossible that the ligament should ever have been generated by the exercise of the tendon, or in the course of that exercise, forasmuch as the force of the tendon perpendicularly resists the fibre, which confines it, and is constantly endeavouring not to form, but to rupture and displace, the threads of which the ligament is composed."

Paley's account of the function of the annular ligament at the ankle is correct, and strikingly put. A similar ligament occurs at the wrist, and navvies who have hard muscular work to do in digging and shovelling are wont to reinforce this ligament and to keep it from rupture by a leather strap round the

wrist. The strap performs exactly the same function as the ligament, and from Paley's point of view one is as artificial, as much a 'contrivance,' as the other. But his point of view is wrong. He conceives the Creator as having at his disposal fully formed elements or materials—sinews, bones, ligaments, and the like—and assembling them into a working mechanism. In fact, however, none of these things is now what it was originally—time, as Plato says, has changed its "name and shape." The annular ligaments are recognized by modern anatomists as having originated in special thickenings of the fascial sheaths of the adjoining muscles of the wrist and ankle. They had a function which was not originally connected with keeping down the long tendons that run along the interior angle of the leg and foot. Contractility, as biologists tell us, is a fundamental property of living protoplasm; and it is easy to imagine that, at the very beginning of the formation of muscular structure and bone articulation, two lines of contractile force might cross each other and thus permit the gradual evolution of the present arrangement, nature continually visiting with disability and extinction those individuals in whom the resisting power of the muscles which were eventually to form the annular ligament was unduly feeble, and giving a better chance of life, and of the propagation of their kind, to those in whom it was strong. The instance, in

fact, is one of those in which the explanation of development by natural selection is most obvious and plausible.

In his second paragraph Paley touches on the theory of "appetency," the supposed tendency of natural structure to alter and adapt itself on the lines indicated by the actual exercise of function, and in consequence of that exercise. This is practically the theory since identified with the name of Lamarck. Paley scarcely does it justice, for no Lamarckian would suggest that a muscle could, in the course of its exercise, develop the ligament whose function is to restrain it. The ligament would be developed by its own exercise. But as Lamarckism will be discussed later on, the issue as between these rival theories need not be debated here.

Let us set beside Paley's argument on the annular ligament of the ankle a passage from a modern scientific work, Strasburger's TEXT BOOK OF BOTANY. It will introduce us, from the side of the strictest scientific observation and of the fullest acceptance of the evolution theory, to the same kind of problems as those discussed in Paley's NATURAL THEOLOGY, and it will raise in a very distinct and unevadable fashion the question, what we are to think of the power manifested in the operations of Nature. In the introduction to his work, in which Dr. Strasburger had associated with him three other eminent

German botanists, we find the following remarkable passage dealing with circumstances observed to exist in the 'phylogenetic' or tribal (as opposed to the 'ontogenetic' or individual) history of plant species:—

"Although the great importance of natural selection in the development of the organic world has been fully recognised by most naturalists, the objection has been raised that it alone is not a sufficient explanation of all the different processes in the phylogeny of an organism. Attention has been called to such organs as would be incapable of exercising their function until in an advanced stage of development, and so could not originally have been of any advantage in a struggle for existence. How could natural selection tend to develop an organ which would be useless so long as it was still in a rudimentary condition? This objection has led to the supposition of an internal force residing in the substance of the organisms themselves and controlling their development in certain definite directions. Many naturalists indeed have gone so far as to affirm that only the less advantageous qualities have been affected by the struggle for existence, while the more advantageous have been uninfluenced by it."[1]

One can easily imagine what a modern Paley bent on reconciling orthodoxy and evolution would say to this. He would cry, Design, forethought, intelligence

[1] TEXT BOOK OF BOTANY, p. 3. English translation by Dr. H. C. Porter, 1898. In the fifth German edition, which served as the basis of a revised English translation (1903), another passage (taking note of De Vries' Mutations Theory) is substituted for the above quoted, but the essential meaning is the same.

—here is the clearest evidence of it! And indeed there are many modern biologists who do not shrink from the admission that the processes of nature must ultimately be interpreted in terms of will or intention, not in terms of chance or blind mechanism. Thus, to the Darwinian argument that organs can be and are, demonstrably, formed by gradual adaptation to surrounding conditions without assuming the necessity of purposeful design, it is often replied that the very fact of adaptability is itself one of the strongest evidences if not of design at least of purpose. And J. v. Uexküll, who describes life as consisting essentially in the fact that it proceeds according to design (*planmässig*), has the following remarkable passage in his EXPERIMENTAL BIOLOGY[1]:—

"When we look backwards, every phase in the process of development seems to us to have proceeded in a strictly causal manner from physico-chemical processes. But when we turn to look forward, it is certain that the physico-chemical processes if left to their own causality must immediately bring about the destruction of the organism. In fact, the clearest definition we can give of dying is to say of an organism that its processes now go on no longer teleologically (*zweckmässig*) but only causally."[2]

[1] LEITFADEN IN DAS STUDIUM DER EXPERIMENTELLEN BIOLOGIE DER WASSERTIERE, p. 67. The subject is ably treated by Keyserling, DAS GEFÜGE DER WELT, p. 190.

[2] For instance, the development of an embryo in the womb takes place in strict accordance with physico-chemical laws. But withdraw the element which we call *life* and how different a set of processes would at once supervene! Yet the physical energies in the embryo would remain in amount exactly what they were before.

Yet the modern Paley would be rash in arguing from facts like these (supposing them fully established) to the conscious, intelligent contrivance of a single foreseeing Mind. For very few things in this universe appear to be done as a presiding, conscious intelligence would do them. Conscious intelligence would not have evolved the giant armadillo only that the whole species might be destroyed by the sabre-toothed tiger, and would not have armed the sabre-toothed tiger for the attack on the armadillo in such a way that when he had exterminated the victim-species the formation of his teeth rendered it impossible for him to prey on any other animal.[1] Conscious intelligence would not have allowed the relic of a disused organ, in the shape of the vermiform appendix, to be a constant source of danger and suffering to countless generations of men—danger against which no exercise of prudence or energy can secure them.

Let us examine a couple of other crucial cases. The embryo of every mammalian animal is prepared in the womb for the life it is to live under wholly different conditions. Lungs are formed when there is no air for them to breathe, eyes when there is no light, a digestive system when nourishment is derived as yet direct from the mother's blood. This capacity for anticipatory development during a period of gestation or incubation becomes absolutely neces-

[1] See Weismann, The Evolution Theory, II, 358.

sary for the maintenance of life as soon as animals, ceasing to multiply by merely dividing in two, become more highly organized and have to devote special germ-cells to reproductive purposes. Here is certainly purpose, or, as I should prefer to call it, *directivity*—here we recognize what Reinke calls the *X*-factor in nature. But conscious, intelligent contrivance? We must recollect how many of these embryos are destined to perish at birth or before attaining any appreciable degree of independent life. Would not intelligence foresee that, and bring to birth only what was destined to endure?

Again, there are certain species of butterflies which have put on a coloration and a form the effect of which is to aid them in evading the attacks of birds. They were not created so; they have become so; and the precise manner of the becoming will be fully discussed in a later chapter. Let us assume for the moment that this adaptation did not occur by a series of lucky accidents or by any merely mechanical process. Are we, then, bound to attribute it to intelligent contrivance? The question will be best answered by simply putting a case which admits of no doubt. Suppose there were an island in which there were no birds, except such as prey on fishes or on each other, but never on insects. The butterflies on this island, if there were any, would certainly show no trace of protective form or coloration. But at some time or other insect-eating birds

might be introduced to the island, as the English sparrow has been introduced in Australia. Then, if the extermination of the butterflies did not proceed too rapidly, we might expect, in the course of generations, to see protective adaptations assumed. But could we expect to see them assumed *in anticipation* of the advent of the destroyers? We could not. Naturalists, however much they may differ, as they do differ, upon the question as to how protective adaptations actually take place, would all agree that they could not possibly take place in anticipation of needs not yet present. If they did, we should have a miracle, and where miracle comes in knowledge goes out. The cases where conscious, intelligent contrivance would be unmistakably recognizable are just the cases which never occur. The signal service rendered by the champions of the evolution theory,

> Quos nec fama Deûm, nec fulmina, nec minitanti
> Murmure compressit Cœlum,

is that they conquered the realm of organic nature for true knowledge, and gave the drama of its development a new and profound interest, by showing with an uncompromising courage only equalled by the extraordinarily minute and patient research which justified it, that the *apparent* instances of divine contrivance with which nature teems must be explained by the responsiveness, the adaptability, of living protoplasm. Needless to say, this demonstration

does not in the least *disprove* the existence of God as a supreme, conscious, personal Intelligence.[1] But it does forbid us to deduce the existence of such a Being from the observation of natural phenomena. A living, developing universe has been set in the place of a Divine Mechanician operating on dead matter.

The question, what conception we are to form of the forces of evolution, will be more fully discussed in the succeeding chapters on Biology, as a foundation for views which will afterwards be put forward in relation to Ethics and to Art.

But first we must clear the ground a little by considering what it really is that we are to study, and if it be possible to study it at all. Nature-study if it is to be possible must begin, and if it is to be fruitful must end, in something which is not strictly the study of nature, but which we call Philosophy.

One of the most brilliant examples of that union of philosophic speculation with nature-study which is so marked a feature of the German thought of our day is H. von Keyserling's work, THE STRUCTURE OF THE WORLD.[2] Keyserling begins by laying it down as a postulate of thinking that "The Universe is a rounded, inwardly coherent Whole."

[1] For my own part, I may say I have a difficulty in conceiving the Divine under the human and limited category of intelligent personality.

[2] DAS GEFÜGE DER WELT, Hermann Graf v. Keyserling, 1906.

A postulate of thinking this is indeed, and more than that—it is a postulate of living. If under all the variety and apparent discontinuity of the universe there does not lie *One* all-pervading and unifying Power, then meditation and action are alike vain, for none can tell the hour when some incursion of the unknown may not shatter our cosmos into chaos, or leave us in a new universe with the edifice of our past experience, the familiar home of the spirit, lying in ruins around us. Every one assumes, consciously or unconsciously, that there is such a Power, that the universe is One, that however mysterious, however little known or understood it may be, it is not essentially deceptive or incalculable. The savage and the philosopher alike assume this, and act upon the assumption. It is perhaps possible not merely to assume but to prove it. For let us try to imagine what would be the case if it were not true. If the Principle, the ultimate Reality of the universe, be not one it must be at least dual. There must be not less than two principles. Now there are only three ways in which these two principles—and what we say will hold good for any greater number—can be related to each other. They must either (1) be identical, or (2) they must be complementary, each possessing something which the other is lacking in, or (3) they must negate each other and be mutually contradictory and exclusive. But two absolutely identical principles, if we can conceive such a thing, are in-

distinguishable from one. Two or more complementary principles, again, make up, when taken together, but a single whole, as in the Christian Trinity. Therefore if the universe be really dual, its two principles must negate and contradict each other. Now these two hostile principles must either be equal in force or one must be more powerful than the other. In the latter event, seeing that they divide between them the sum total of existence and thus stand in naked and essential antagonism, with no place for evasion, and no auxiliary or modifying forces to call in, it follows of necessity that if one surpassed the other by even the smallest conceivable excess, it must, in eternity, master it and reduce it to impotence. So by this road we come back to unity again. If, however, we suppose our two forces to be co-equal and co-eternal, we have to ask ourselves what we mean by supposing them to be antagonistic. Antagonism can only arise when there is action. But two equal forces acting in direct contradiction to each other must mutually cancel each other, and the result is zero. On such an hypothesis the universe could never have come into being. It may also be pointed out that the hypothesis itself seems to be irrational. For action means the production of a change of some kind, change in the nature or situation of objects. But if one of our forces is producing changes of a certain kind and the other producing changes of another kind, then they are not contradictory but comple-

mentary. The only real antagonism between two ultimate principles must consist in one of them being identified with action, change, life, the other with immobility and death. But a principle of immobility and death, if there could be such a thing, could not also be a principle of action, not even of destructive action, for to act at all would be a contradiction of its own nature. It would begin and end in total *in*action, and the field would be clear for the other Power, just as if nothing else existed. It follows that, in the living and moving universe around us, there cannot be any such thing as an active principle of destruction and death. We are obliged to perceive Being under the guise of Becoming and Becoming under the guise of Change and Progression. This is a process taking place in the visible and temporal order of things and capable, under certain conditions, of partial arrest or retrogression. But the Whole, regarded as a whole, can be and can contain nothing but life, and must under all its diversity (which is an aspect of life) be One. It is this unity which alone can make intelligible and rational the diversity of which every study of life must treat. It is my endeavour in the present work to bring into clear light some important aspects of this unity, as revealed in the interrelations of the parts of which, to our eyes, it seems to be composed.[1]

[1] See Appendix A.

CHAPTER II

THE WHEEL OF LIFE

I heard them in their sadness say
The earth rebukes the thought of God ;
We are but embers wrapped in clay,
A little nobler than the sod.

But I have touched the lips of clay ;
Mother, thy rudest sod to me
Is thrilled with fire of hidden day,
And haunted by all mystery.—A. E.

IT has long been known that no definite line of demarcation can be drawn between the animal and the vegetable worlds. There are lowly organisms which cannot be decisively referred either to the one or to the other. It has been more recently shown that the apparently more strongly marked line between the living and the non-living also grows wavering and indistinct in places. Metals are known to respond to stimuli and to show 'fatigue' in a manner commonly attributed only to the nervous system of animals,[1] while some of the phenomena of

[1] See Jagadis Chunder Bose, RESPONSE IN THE LIVING AND THE NON-LIVING, *passim*. The following passage sums up the results of many delicate experiments in the response to electrical stimulus. "We have seen," writes the Indian physicist, "that the criterion by which

crystallization strongly resemble those of vitality.[1] Le Dantec has uttered the latest word of physics on this subject, where he insists on the "absence of all essential difference and all absolute discontinuity between living and non-living matter."[2] Indeed, one

vital response is differentiated is its abolition by the action of certain reagents—the so-called poisons. We find, however, that 'poisons' also abolish the response in plants and metals. Just as animal tissues pass from a state of responsiveness while living to a state of irresponsiveness when killed by poisons, so also we find metals transformed from a responsive to an irresponsive condition by the action of similar poisonous reagents" (p. 188).

[1] At a meeting of the British Association in 1905, Professor H. A. Miers, in a lecture on 'The Growth of a Crystal,' is reported to have said, The most wonderful feature of crystals was the manner in which they grew, just as though they were living things. Two features deserved special attention. The first was the remarkable power crystals possessed of healing themselves when mutilated. If a growing crystal were removed from a solution, broken at one of its corners, and re-immersed in the solution, it would continue to grow, and as it grew would restore the missing part, and become once more a completely symmetrical figure. This power of continuing to grow was possessed by a crystal even after countless ages, so soon as it was immersed into the appropriate solution. In this sense the crystal was immortal, for it never lost its vitality, or power of growing. The other remarkable feature was the growth of crystals in over-saturated solutions. In solutions only slightly over-saturated, no spontaneous generation of crystals was possible. It was true that a solution only slightly over-saturated would often begin to crystallize, apparently spontaneously, when exposed to the air, but this was because there were minute crystal fragments of the dissolved substance floating about in the air which got into the solution with the dust and so inoculated the solution with crystal germs, just as the human body might be inoculated with disease by a disease germ. If these germs were kept out, the solution would not crystallize until it was very strongly over-saturated, and then, at a certain strength, it would suddenly begin to crystallize spontaneously and with great rapidity.—*Times*, August 5, 1907.

[2] The Nature and Origin of Life (Eng. trans.), p. 250.

may say of nature-study in general, that if, as Plato said, the beginning of knowledge is in definitions and classification, the end of it lies in getting rid of them. There is probably no such thing as a universally applicable definition of any group of natural phenomena. *There is certainly no condition of matter of which we are entitled to say that Life is impossible without it.* Still, natural groups have well-marked central features, even if at their margins they melt into something else. Now the things which in the ordinary sense of the word we call Living are marked by these characters: Their chemical constituents are always compounds of carbon. These compounds are what is called 'unstable'—they 'consume' or disintegrate by combining with oxygen in air or water. In this process organisms obtain the energy necessary for assimilation and growth. The above characters (carbon-compounds, chemical instability, and faculty of assimilation) apply to plants and animals alike. But we find, in general, that plants are able, from inorganic mineral constituents such as carbonic acid, water, nitrates, sulphates, etc.,[1] to build up the organic compounds like proteid, albumin, the carbohydrates, alcohol, fat; while animals use for their nourishment not the inorganic substances but

[1] It is not to be assumed, however, that these substances are merely passive objects in the process. The life which is in them has doubtless as much to do with the result as the life which is in the plant. This is a side of the question which calls for further investigation.

only organic compounds already formed by plants or by other animals. A well-developed vegetable world must therefore, it would seem, have preceded the appearance of animal life on the globe.[1] It was long believed that these organic compounds of carbon could only be formed by the vital action of living vegetation. One of the epochs in the history of modern chemistry has been the demonstration (first by Wöhler, in 1828,) that many of them can be produced in the laboratory from inorganic chemical constituents. But this is only effected by circuitous and difficult ways, and—a circumstance often overlooked — it only resembles what is accomplished in nature if we include under nature the directive agency represented by the chemist himself, as well as the materials with which he deals.

The characteristic colour of living vegetation is green. This is also the rarest of colours among the higher animals.[2] It is due in vegetables to the presence in their cells of grains of the substance known as chlorophyll, which very few animals

[1] It is however suggested by Professor E. Ray Lankester, in his article, 'Protozoa,' in the ENCYCLOPÆDIA BRITANNICA, that the most primitive forms of organic life did not possess chlorophyll but fed on albuminoids, etc., which constituted the earliest steps in their own evolution.

[2] In Beddard's ANIMAL COLORATION note is taken of the green fur of the sloth as a most uncommon if not unique phenomenon. It has been ascertained that the sloth has grooved or fluted hairs, which form the habitat of a minute green fungus to which the colour is due.

possess or have need of. It is developed normally under the action of sunlight, and plays a most important part in the economy of the plant. The usual method by which any organism obtains the energy necessary for its vital functions is through the oxidization, *i.e.* the slow burning, of its substance, by combination with the oxygen of the air. The process is to all intents the same as the more rapid oxidization, under great heat, of coal in a steam-engine. If a plant can obtain sugar, which oxidizes easily in contact with atmospheric oxygen, it has thus a fund of energy to draw on for all the processes of its life. Now sugar is composed of carbon and water. Carbon exists in the air, in combination with oxygen, in the form known as carbonic acid. Chlorophyll, in some way as yet unexplained, enables plants, when acted upon by light, to take in carbonic acid from the air and to disintegrate it into its constituents, carbon and oxygen. The oxygen disappears again in the air, and the released carbon combines with water in the plant to form sugar,[1] thus giving the plant its needed store of potential energy. All it does with this energy is to live, grow, and reproduce its kind; till at length a time comes when the assimilative energy weakens relatively to the forces of decay, and the plant dies; it is again resolved into the chemical constituents from which it was built

[1] Or starch, which easily decomposes into sugar, and which is composed of the same elements.

up; but not without having passed on the flame of life to burn afresh in its descendants.

Plants which have no chlorophyll, like certain bacteria and moulds, and which, therefore, cannot decompose the carbonic acid in the air for their nourishment, offer an interesting example of the manner in which Nature contrives to get her way, if not by the normal instruments, then by the utilization of others. They acquire their first store of energy sometimes like animals, from other organic compounds, or they take carbon from acetates and tartrates. The nitro-bacteria appear to depend on ammonia derived from decaying animal matter, and the moulds draw their energy from sugar, which (as in our jams, etc.) they find already formed.

There are other plants, such as the fly-eating *Drosera*, which feed upon organic substances with the aid of digestive juices, exactly as animals do; and there are animals, such as *Hydra* and others, of very primitive form,[1] which produce chlorophyll and are thereby enabled, like plants, to feed upon carbonic acid. The distinction therefore which has been drawn between the two kingdoms as regards their modes of nourishment must, like other definitions of natural groups, be taken to apply to central and typical forms and not to constitute a distinct boundary line. Allowing for these exceptional cases, we may say broadly that the wheel of

[1] Ray Lankester, *op. cit.*

life makes its full circle in passing from inorganic matter through plants to animals and thence back to gases and minerals again. The process of taking in fresh matter, transforming it chemically into living tissue, and thus repairing the waste occasioned by the decomposition of the carbon-compounds of that tissue, is technically known as Metabolism. This is the typical and characteristic function of organic life.

Now this function of living matter, or Protoplasm, depends upon two elements: first, its Substance; secondly, its Structure. As regards the former, we are in this serious difficulty, that living matter can never be chemically investigated by any means at present known, for it dies immediately in presence of any of the reagents which are used to ascertain its chemical composition. It is known that there are no *elementary* substances in living matter which are not also found in the world of inorganic matter, but it is also known that their synthetic combination in living is different from that which obtains in dead tissue,[1] and it is precisely through this factor—that of the grouping or synthesis of elements—that the most remarkable forms of energy are developed.

[1] Verworn, GENERAL PHYSIOLOGY, pp. 102, 478: "Physiological chemistry has shown that between the two kinds of substance very essential chemical differences exist, which prove that living substance experiences in dying pronounced chemical changes. A widespread difference between the two consists in their reaction. The reaction of living substance is almost without exception alkaline or neutral, and

The secret of life, therefore, cannot be stated in terms of chemistry, because we cannot surprise the secret of its chemical synthesis. Even if we could do this we should still be unable to say why certain syntheses should appear in living matter and resolve themselves into others at death.

We find, however, in the investigation of organic tissue (plant or animal) by such means as are available, that one substance is common to all the organic and is never found (as such) in the inorganic world. This is called Proteid. It is composed of five elements—Carbon, Hydrogen, Sulphur, Nitrogen, and Oxygen, which are combined in proportions not at present ascertained. Subject to the limitations just set forth we may say that proteid is the essential stuff of organic tissue. The two other usual (though not, like proteid, universal) constituents of this tissue —the Carbohydrates (sugar, starch, etc.) and the Fats—are, it is believed, formed partly from the products of the metabolism of proteid.

When we come to deal with the essential Structure of life we are in much the same difficulty as that in which we found ourselves in investigating its chemical Substance. We can observe living cells under the microscope, but the most powerful micro-

with death changes usually to acid. . . . Physiological chemistry has shown similar changes in death in great number. All these facts prove that in the death of living cell-substance certain chemical compounds undergo transformations; hence substances exist in it which are not to be found in dead cell-substance."

scope has never reached the limits beyond which we can say that there is no structure. There is another limitation too. The microscope has revealed the fact that all living tissue is made up of cells, but the internal structure of the cell, beyond the fact that it is composed of a fluid substance within which a darker coloured nucleus is usually embedded, could not be ascertained until the recent device of staining the object with aniline dyes had been thought of. Different substances in the cell are found to take these dyes differently, and thus a world of structure of the most singular kind has been revealed in what formerly seemed a simple, semi-transparent fluid. Some parts of this structure hover, as it were, upon the very edge of perceptibility, the most suitable dyes for bringing them under observation not having been as yet discovered. There may be others which no dye can reveal, but which are yet active and necessary parts of the organism. Moreover, here too the cell is killed by the means taken to observe it, and the processes in which its structure is engaged can only as a rule be deduced from the observation of a great number of cells in which their internal movements are arrested at different stages of completion.

It has been practically demonstrated that all organic life must be at least duplex if not multiplex in its constituent elements. In its simplest known form it consists of Protoplasm and Nucleus. We

know that the carrying-on of all vital functions depends on peculiar relations existing between these two elements, but what these relations exactly are is still quite obscure. Both protoplasm and nucleus are compounds of proteid with other chemical substances not yet fully determined. Protoplasm is a fluid, and has been shown by the epoch-making observations of Bütschli[1] to have a structure resembling that of an exceedingly minute foam. The nucleus usually exists in the form of a single definite body, but it may be scattered through the protoplasm of the organism in little granules. In the lowliest of organisms, the *Amœbæ*, we have simply a speck of protoplasm containing a nucleus, but with no surrounding wall of the harder substance which protoplasm builds up for itself in the cells belonging to higher forms of life. Such amœboid forms are the white corpuscles in the human blood, whose slow changes of form we can observe under the microscope, and which play so important a part in our economy by feeding on the noxious bacteria which produce the various forms of blood-poisoning and zymotic disease.

A more detailed account of the functions and structure of the cell must be reserved for the next

[1] In 1892. An English translation of Bütschli's work on Microscopic Foams and Protoplasm, by E. A. Minchin, appeared in 1894. The nucleus is really a form of protoplasm, chiefly differentiated from the 'cytoplasm,' or protoplasm of the cell, by containing a large amount of phosphorus.

chapter. In considering these and all other phenomena of vitality let me again recall the warning expressed in the taunt of Mephistopheles to the young student: the lines are as true to-day as they were when Goethe wrote them over a hundred years ago:—

"If some living thing you would learn about,
You begin by driving its Spirit out;
There lie the parts of it, one by one,
But the binding Spirit, alas, is gone!"

CHAPTER III

DE MINIMIS

Immense have been the preparations for me,
Faithful and friendly the arms that have help'd me.

. . . . . .

Before I was born out of my mother generations guided me,
My embryo has never been torpid, nothing could overlay it."

WALT WHITMAN.

THERE are two functions of organic life which are often confused together, but which it is well to keep distinct in our thought. These are Growth and Development. The mark of growth is that an organism, by assimilation from the outside world, becomes *larger than it was.* But in development it becomes *different from what it was.* The history of an embryo in the womb presents a succession of phenomena which, when one comes to realize them, almost stagger thought; for, while remaining the *same thing* all through, it is continually becoming a *different class of thing*—first two cells, then one cell, then a fish, a quadruped, ultimately a human being. This is Development. Once born, it is laid hold of by the principle of Growth which lasts until maturity. Now in the groups called Species, as well as in individuals, we observe exactly the same distinction.

The members of a species multiply and increase their numbers. This is Growth. But under certain conditions, which we have now to investigate, they vary in type and ultimately give rise to new species differing widely from that from which they sprang. This we call Development or, in the more popular term for the process when applied to species, Evolution.

The investigation of this process in all its details has been the master-impulse of biology ever since the fact of the process was established by the researches of Darwin.

In Darwin's time the study of evolution was mainly an affair of what is called Natural History But it has now been realized that fully to comprehend the processes involved—so far as they can ever be comprehended—it is necessary to find out of what kind of material living beings are composed, and how their fundamental processes take place. "The ultimate problems of sex, fertilization, inheritance, and development," says Wilson, have been now "shown to be *cell-problems*."[1] Before going further, therefore, we must give some account of the leading facts connected with the structure and vital action of the cell.

Since the publication of the ORIGIN OF SPECIES, probably the most important contribution to bio-

[1] THE CELL IN DEVELOPMENT AND INHERITANCE, 2nd edition, p. 9.

logical theory is to be found in the researches of Dr. A. Weismann, and particularly in his large work, The Evolution Theory, of which a masterly English translation has recently appeared.[1] Weismann, on one side, represents an heroic attempt to bring back to the strictly mechanical principles of Darwinism the tide of biological speculation, which has been flowing more and more in the direction of recognizing an essential and not a merely fortuitous connexion between the goal of the evolution of natural forms and the means taken by nature to attain it. On another side he has brought the physiology of the cell into true relation with the natural history of the organism and of the species, and has become the author, or at least the first great expounder and systematizer, of a theory of heredity—the now famous Germ-Plasm theory—much of which seems a solid, permanent, and deeply important contribution to knowledge. But this theory seems to lead straight to a non-mechanical or psychic conception of the driving-force of evolution, and Weismann has therefore supplied the other part which, in the view of the present writer and of many others better qualified to judge, seems to be of the nature of a baseless and improbable hypothesis, devised to find a means of avoiding recourse to any non-mechanical conception of the ultimate nature of evolutionary processes.

As we shall be much concerned with Weismann's

[1] By J. A. and M. R. Thomson, 1904.

views, let us place at the head of our study of them a couple of passages in which his general attitude towards the phenomena of vital processes is expressed.

"In our time," he writes, "the great riddle has been solved—the riddle of the origin of what is best suited to its purpose without the co-operation of purposive forces."[1] "We must certainly assume," he declares, "that the mechanical theory of life is correct."[2]

A longer passage shows us what he understands by 'mechanical':—

> "The living machine differs essentially from other machines in the fact that it constructs itself; it arises by development from a cell, by going through numerous stages of development, but none of these stages is a dead thing, each in itself is a living organism whose chief function is to give rise to the next stage. Thus each stage of the development may be compared to a machine whose function consists in producing a similar but more complex machine. Each stage is thus composed, just like the complete organism, of a number of such 'constellations' of elementary substances and elementary forces, whose number in the beginnings is relatively small, but increases rapidly with each new stage."[3]

It would have been simpler, but it would not have suited Weismann's conception of nature, to say that the "living machine" differs essentially from other machines in not being a machine at all, or anything

[1] The Evolution Theory, II, p. 391.
[2] *Ibid.*, I, p. 368.
[3] *Ibid.*, I, p. 404.

in the least like one. No machine constructs itself. No machine can do anything but repeat a certain series of movements, each series exactly similar to the last. What Weismann has described is *not* a machine, just because it *is* a living organism. It is surely as true in biology as it is in mechanics that in any purely physical chain of sequences you cannot by any possibility get more out at the end than you put in at the beginning, unless you take it in upon the way.

"Development," writes Weismann, "is an expression of life."[1] But "life," again, is merely "a chemico-physical phenomenon."[2] To say that development is an expression of a chemico-physical phenomenon does not seem a very illuminating or helpful generalization. The fact is that the statement that life is a chemico-physical phenomenon does not take us further towards an understanding of the subject than when we say, what is equally true, that chemical and physical phenomena are a manifestation of life. Life is everywhere. We use it as a convenient term for the energies associated with 'living' protoplasm, because we observe that when it is present protoplasmic structures act and react (as in the phenomena of nutrition, for instance) in certain chemico-physical ways, while, if it be absent, the same protoplasm acts in other ways, also chemico-physical, but quite different from the former, and analogous to the ways of

[1] THE EVOLUTION THEORY, I, p. 353. [2] *Ibid.*, II, p. 52.

minerals and of gases into which dead protoplasm finally resolves itself. The chemico-physical actions and reactions appear in a living plant or animal to be under the direction of a force devoted to the preservation of that particular organism. The smallest atom of organic life includes not only a chemical compound but a chemist. In the mineral world we may say broadly that there is no individuality of parts.[1] With protoplasmic structure, therefore, a stage is reached in the evolution of life which we may rightfully call 'life' *par excellence*, but there has been no breach of continuity, and it is highly probable, as Weismann himself suggests, that far below the limits of microscopic observation the transformation of 'dead' into 'living' matter is continually going forward. When, therefore, we speak of the action of living protoplasm the distinction is rather between this action and that of a piece of mechanism than between protoplasm and minerals or gases.

The phenomena of cell-growth, reproduction, and heredity are those which lie at the basis of all organized protoplasmic life, and in all the forms of that life, vegetable as well as animal, they are extraordinarily similar; there is, in fact, nothing which all the species of living things have so much in common. One of the most wonderful and fascinating chapters in the whole range of science is

[1] But note the transition stage exemplified in the natural history of crystals (*vide* p. 22).

that which contains the account of these processes, and it is only within the last few years that it has been possible to write it. Weismann, in a certain section of his EVOLUTION THEORY, has brought the facts together in a manner which, for its lucidity and mastery of the subject-matter, deserves to be called a classic example of scientific exposition.[1] To understand the basis of the higher manifestations of life, these processes, as we have said, must first be understood, and an account of them, based on Weismann, and accepting his germ-plasm theory so far as it seems to accord with established facts, will be given, of course only in the broadest outlines.[2] At the same time it will be attempted, here and there, to throw some light on the *rationale* of the processes described.

All animal and vegetable structure arises from cellular tissue, and in fact *is* either cellular tissue or, as in the case of bones, scales, etc., the mineral deposit formed by the action of cells. The simplest living forms are composed of single cells, and the most complex and huge of them were each once nothing more than a single cell, possessed of the powers of development and growth. In multi-

[1] "It has been Weismann's great service to place the keystone between the work of the evolutionists and that of the cytologists, and thus to bring the cell-theory and the evolution-theory into organic connexion" (E. B. Wilson, THE CELL, p. 13).

[2] Prof. Wilson's work on the cell (see note on p. 33) may be referred to for a comprehensive and detailed statement of all that is known at present on this subject.

cellular organisms, this single originating cell is usually formed by the fusion of two imperfect cells by what is indifferently called conjugation, sexual reproduction, or 'amphimixis.' All cells, whether they are the product of conjugation or not, grow, when they do grow, fundamentally in the same way, and this way must now be described.

The contents of the typical cell are broadly differentiated into (1) a more or less hardened envelope containing (2) a subtance called cytoplasm (Gk. *κύτος*, a cell), and (3) a small, rounded, dark-coloured body called the nucleus. Until recently nothing more than this was known of the structure of the cell, and nothing at all of the functions of the nucleus. Now, keener microscopic research and better instruments have thrown a flood of light on cell-organization, and the nucleus is revealed as a powerful factor in the vital processes of the cell and the bearer of its hereditary substance[1]—that which makes it a cell of some particular organism, plant or animal, and of no other. This hereditary substance, divined by the botanist Nägeli, and since observed by Weismann and others, is called 'chromatin' (from the fact that it is observed by means of the stain it takes from the addition of an aniline dye), or 'idioplasm' (Nägeli's appellation), which might be rendered the 'selfhood substance' of the cell.

[1] According to Wilson (*op. cit.*) this was guessed by Haeckel in 1866, and confirmed in 1884–5 by the almost simultaneous discoveries of O. Hertwig, Strasburger, Kölliker, and Weismann.

Cellular structure begins, as has long been known, by the division of a cell into two, each of the parts then proceeding to grow by the assimilative power of protoplasm and in due time to divide in its turn. A mass of these cells is called 'cellular tissue.' The so-called 'budding' of a small cell from the side of the parent is, of course, simply a form of division. The process of division and redivision goes on, accompanied by a differentiation in the shape and function of the different cells or groups of cells which are formed, until the structure of the plant or animal is completed. In these operations the nucleus plays the principal part. The division of the cell is essentially the division of the nucleus. A detached portion of a cell which contains nothing of the nucleus can reproduce itself no more; it perishes.

When a cell is about to divide, an organ of recent discovery, termed the 'centrosome,' comes into play. This appears as the core of a sort of rayed or star-like figure, and it takes up its position beside the nucleus. When the cell is resting, the chromatin is dispersed through the nucleus in a mass of broken lines, forming a kind of network. When division begins, this broken-up substance forms itself into a series of small threads, sometimes straight, sometimes looped or curved. These are called 'chromosomes.' There are always a definite and invariable number of chromosomes for every species of plant or animal—the cell of a man

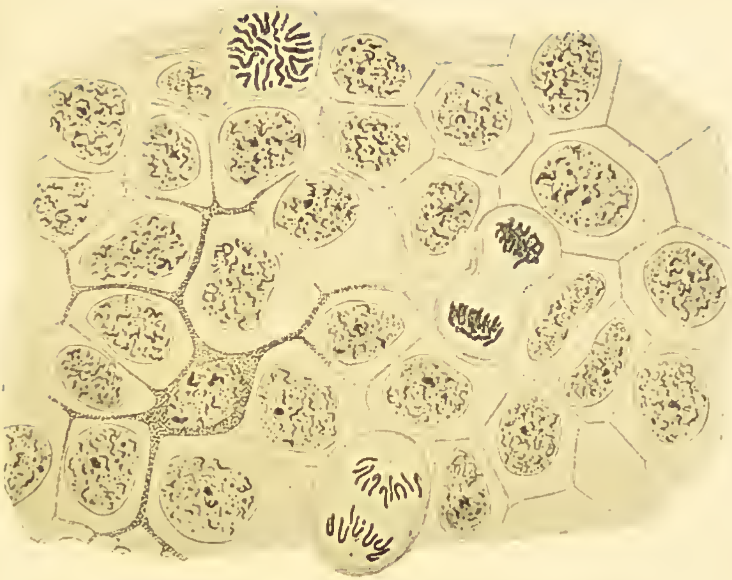

FIG. 1.

This illustration, which (by permission of The Macmillan Co.) I take from Wilson's work, THE CELL, is one of remarkable interest, for in it the microscope has caught, in a piece of actual tissue from the skin of the salamander, *Amblystoma*, three nuclei in different stages of mitotic division. Most of the nuclei, which are seen as large, roundish objects in their respective cells, show the chromatin in its 'resting' condition interspersed through the nucleus. The nucleus under *a* shows the chromatin gathered into chromosomes. At *b* the centrosomes with their astral figures (which can barely be detected) have been formed, the chromosomes have carried out their longitudinal division, and are being attracted half towards one centrosome and half towards the other. A little above this the process has been carried further, and the sides of the cell are beginning to contract, preparatory to forming two new ones. In Fig. 2 will be found a clear representation of the astral figures.

To face p. 40.

has so many,[1] of a grasshopper so many, of a lily so many. The chromosomes range themselves in a belt across the centre of the nucleus, and the centro-

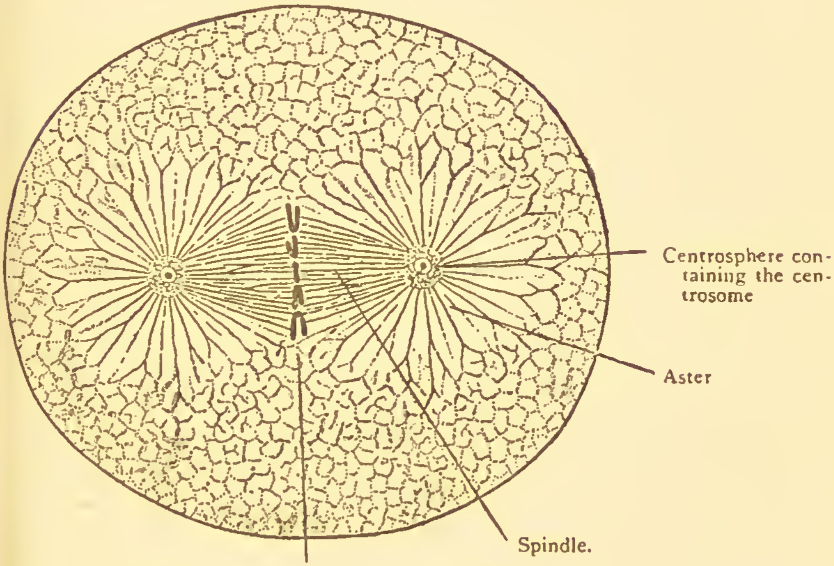

FIG. 2.

The above illustration from Wilson's THE CELL shows in more or less diagrammatic form the stage of nuclear division in which the chromosomes, as yet undivided, have arranged themselves in the centre of the nucleus. The centrosomes with their astral figures have been formed, and have taken their places near each pole of the nucleus. The next stage is represented at *b* in Fig. 1.

some breaks into two parts, which take up a position one at each end of the nucleus. Regarding the nucleus as a tiny globe, we may say that the chromo-

[1] Sixteen have been counted in the human cell. A grasshopper has twelve, a lily twenty-four. The number is almost always an even one, but as with everything in Nature there are exceptions to the rule.

somes lie in the equatorial plane, while the two parts of the centrosome move towards the North and South Poles respectively.

The centrosomes, at the two poles of the nucleus, are surrounded each with a halo of ray-like processes (the centrosphere), and on the sides next each other these rays penetrate the nucleus and join, forming a spindle-shaped figure with a centrosphere at each end. This spindle figure appears to be the organ by which the division is accomplished, for each of the chromosomes now splits itself in two longitudinally, as one cleaves a log of wood, and one half passes over to each centrosphere, thus making an exact division of the whole chromatin or hereditary substance. An indentation now appears in the outer wall of the cell and also in the nucleus—it deepens and deepens, and finally two cells appear instead of one, each with a nucleus, a centrosome, and a supply of chromatin, the latter now breaking up into its original condition of diffusion through the nucleus. In multicellular organisms the two new cells, of course, do not separate, but a wall is formed between them. Some plant-cells contain several nuclei; in this case division of the nucleus is not necessarily followed by that of the cell.[1]

[1] The process briefly described above is that of 'mitotic' division (Gk. *μίτος*, a thread, from the appearance of the chromosomes). Amitotic division, in which the cell and nucleus simply divide in two without the formation of chromosomes, also occurs under certain conditions, but is usually an abnormal or degenerative process (cf. Wilson, THE CELL, pp. 116–119).

Throughout the processes of cell division it is apparent that the utmost care is taken to ensure an exact partition of the chromatin between the two new cells. This partition has to be qualitative as well as quantitative; for one chromosome may, and no doubt does, differ in function and influence from another, and has various elements within itself. The *longitudinal* division of each chromosome, in which the elements are arranged like beads on a rosary, ensures that the different elements of the whole hereditary substance shall appear in each new cell in exactly the same relative proportion as in the parent cell; just as if two persons had to divide between them a dozen apples of different varieties, and secured perfect equality, not by taking six apples each, but by dividing every apple in two. *This is the fundamental cause of the fixity of species,* which means the production of offspring having the same specific characteristics as their parents. How, under these conditions, the *mutability* of species is brought about must be discussed later. It is first of all necessary to inquire more closely into the composition of the chromatin, and to study the special phenomena of cell-growth in connexion with conjugation, where new and extraordinary features come to light.

A chromosome is not, or is not usually, a simple body. In all but the very lowest organisms it is composed, as we have said, of a number of elements.

Each of these elements is styled a 'determinant,' and it controls the form, colour, and function of some definite part of the future plant or animal. Weismann believes the determinants to be grouped into complex bodies called 'ids,' each id containing all the determinants necessary for a whole being, and each chromosome being composed of a number of ids. These ids are microscopically visible; they form the beads on the rosary already referred to; but their exact composition and potency are largely conjectural at present. How far the subdivision of determinants may go, it is, of course, impossible to ascertain. We cannot say, for instance, whether there is a determinant for every hair of the head, or one for the hirsute covering in general, or one for each of the different sections of the scalp. But the division is very minute. Each of the ids may be a very complex body, as we see by the manner in which, in some families, small physical signs like a patch of hair differing from the colour of the rest, or a tiny pit or mole on the skin of a certain part of the body, may be handed down, in that precise position, for generations. There may be, and, in fact, in the higher plants and animals there *must* be, a number of determinants for each part of the structure, and the final characteristics of that part must be the resultant of a blend of all these determinants, the more powerful predominating in proportion to their vitality and force. The whole body of the chromo-

somes may therefore be said to represent one or more complete beings in diagrammatic form, each part of the complete animal or plant being represented by some part of a chromosome, though of course not physically resembling it. And we thus strike on the very curious and startling fact that, as far as we can see, *every* cell in every organism throughout the world of life contains all the elements of the whole being to which it belongs, and is, potentially, that being.[1] All the higher organisms possess two kinds of cells—reproductive cells which have the faculty of fusing together to reproduce their kind, and 'somatic' or body cells, which, although they all originate in a reproductive cell, multiply only by division, and have the function of forming the various parts of the bodily structure. Of the nucleus of a germ cell "we cannot say that it differs in any essential or definite way from the nucleus of any other cell."[2] All possess the chromatin or hereditary substance of the organism, though, according to Boveri, the germ cells alone receive *all* the chromatin of the parent cell, the derived somatic cells having to part with some of it.[3] There may be some distinction, though on what

[1] "Every animal appears as a sum of vital entities, each of which bears within itself the complete character of life" (Virchow, CELLULAR-PATHOLOGIE, p. 12, 1858).

[2] Weismann, THE EVOLUTION THEORY, I, 251.

[3] It is cast out into the cytoplasm—the substance surrounding the nucleus—where it degenerates (see Wilson, THE CELL, p. 147).

it may be based it is at present impossible to say, between cells that are capable of developing into a complete organized creature and those that are not.

Every somatic cell is doomed to perish, but every reproductive cell now upon the globe is united, not metaphorically, not by a chain of successive originations or impulses, but by actual identity of substance, with the first beginnings of protoplasmic life in the abyss of time; and it has before it a potential immortality commensurate with life itself. It is not, as used to be thought, a physiological product of the organism in which it dwells; it is a part of the original reproductive cell from which that organism sprang.

To understand these conceptions we must now study the phenomena of reproduction in the light of recent discoveries.

The lowest form of the reproductive process is, of course, by simple division and redivision. This is characteristic of many of those organisms which consist only of a single cell, and it may co-exist, even in these, with a considerable degree of structural complexity, as in the 'trumpet animalcule,' *Stentor raselii.* But among the lowest of these unicellular organisms a curious process is sometimes observed to take place, in which we may doubtless recognize the origin of sexual reproduction. Two, three, or

more *Amœbæ*[1] approach each other, partially coalesce, and remain united for some time. They then separate again. No new creatures are formed by this contact; there are no visible results at all. But that *something* which is for the advantage of the organisms takes place during this period of union is certain, and in the light of what is known of processes in other organisms we can make a very good guess at what this something is. Each *Amœba* parts with some of its chromatin to some other and receives an equivalent in exchange. The creature is thus reconstituted. The element of *change*, which always provides so marked a stimulus to vital processes, has been obtained. The process has actually been observed in a certain Infusorian, *Noctiluca*. Two *Noctilucas* coalesce, and then proceed to divide *at right angles to the plane of contact*. This necessarily has the effect of giving to each of the two new *Noctilucas* which result from the division half the nucleus and chromatin of one parent and half of the other. There is, however, no actual new birth or multiplication of beings; there are only two *Noctilucas* as before.

We can now imagine that if a certain class of unicellular organisms are in the habit of approaching each other for the purpose of this interchange of portions of their chromatin, they might occasionally, under the influence of the approaching conjugation, expel those portions of chromatin *before* another cell

[1] *Amœbæ*. See p. 30.

was in a position to receive it. What would happen if two cells, each of which had thus got rid of half its chromatin, were to come into contact? Plainly, they would fuse together; they would not separate again; they would become a new organism. Each would have supplied just what the other lacked.

This process, forming the bridge from mere cell division to sexual reproduction, is a hypothetical one; it has not, I believe, been actually observed in unicellular organisms, but it is exactly what we find to be taking place when we reach the stage of sexual reproduction among multicellulars. Multicellular organisms of more or less elaborate structure plainly cannot, without breaking up, fuse together like single cells. How, then, are they, as a species, to gain the advantages of the temporary union and interchange of elements which we have observed in the low unicellular organisms? Only in one way—by producing special cells for this purpose. These cells must represent the whole parent, they must be capable of shedding half their chromatin, and, when they have fused, must be capable of growing into a complete organism like the parent. When these specialized cells have been formed, the others, the somatic cells, will at the same time have been specialized for other functions, and will thus naturally lose the original capacity for interchanging chromatin with other cells, *i.e.* for conjugation. We see the significance, then, of Weismann's remark, "germ cells made their

appearance along with the multicellular body."[1] They are an instance of that differentiation of structure and function which takes place in all highly organized life. We must note also that the benefits of conjugation which are realized *individually* by the lowest unicellular forms are only realized *as a species* by the multicellulars. A species must, then, be regarded as in some sense an organic whole, and not as a mere aggregate of individuals.

In some very curious cases which stand on the borderland between sexual and non-sexual reproduction, the same organism is capable of employing both methods. Thus, among the lower seaweeds (*Algæ*), the genus *Pandorina* consists of a colony of sixteen green cells contained in a kind of gelatinous matrix which the cells excrete. Each cell is ordinarily capable of recreating the whole organism by division. But after this process has gone on for some time, the need of conjugation is felt, the colony breaks up and cells begin to fuse with each other, though never with those of the same colony. In *Pandorina* the two conjugating cells are similar in appearance, but in the genus *Volvox* we begin to see a difference in the appearance of the two kinds of conjugating cells. What may be called the 'female' cells (germ cells) are large and quiescent; the 'male' (sperm cells) are smaller and active. The primary meaning of this is that the larger cells have stored up a supply

[1] The Evolution Theory, I, 265.

of nutriment for the young organism, and are therefore bulkier and less active, while the others contain only the bare elements of cell-structure and are therefore able, as they are obliged, to be active in order to search out their quiescent mates. A strictly vegetable organism, in this stage, may therefore possess organs of locomotion, and be as free-moving as a fish. A remarkable fact has come to light respecting those organisms (like some *Algæ* among vegetables and Infusorians among animals), which are capable both of conjugation and of reproduction by division, namely, that the supply of nutriment often determines which method shall be followed. If nutriment is abundant, division is practised; if it becomes scanty, an impulse appears to be given to conjugation. Infusorians, which ordinarily conjugate at pretty regular intervals, can be kept indefinitely from doing so, and confined to division, by the simple process of supplying abundance of nutritive matter in the water in which they live.

"As far as we can see from an a priori point of view," writes Dr. E. B. Wilson in his great work on cell structure and cell phenomena, "there is no reason why, barring accident, cell-division should not follow cell-division in endless succession in the stream of life. It is possible, indeed probable, that such may be the fact in some of the lower and simpler forms of life where no form of sexual reproduction is known to occur. In the vast majority of living forms, however, the series of cell-divisions tends to run in cycles in each of which the energy of division

gradually comes to an end and is only restored by an admixture of living matter derived from another cell. This operation, known as fertilization, or fecundation, is the essence of sexual reproduction, and in it we behold a process by which, on the one hand, the energy of division is restored, and by which, on the other hand, two independent lines of descent are blended into one. Why this dual process should take place we are as yet unable to say."[1]

The actual mechanism of sexual reproduction is essentially the same wherever it occurs, whether in a seaweed or a human being. Two cells have to play their part in it, the Germ cell and the Sperm cell, and these, in the higher orders of organized beings, come to be located respectively in distinct classes or sexes of individuals. Reproduction begins by the fusion of a sperm, or male cell with a germ, or female cell.

These cells originally resemble the other cells of the same species, containing the same number of chromosomes. If this number was, say, sixteen, which is believed to be the number in man, then a fusion of two complete cells, if it were possible, would produce a cell with thirty-two chromosomes, and that would mean a different species of animal. What happens is that each of the reproductive cells, male and female, prepares itself for conjugation by getting rid of half its chromosomes. Two divisions

[1] The Cell, p. 178.

of the nucleus take place, *not* as in the ordinary fashion of cell-division, when the chromosomes split longitudinally, but in such a way that, in each division, four of the sixteen chromosomes are bodily expelled from the nucleus and from the cell, when they either perish or, in some cases, appear to help in forming an envelope of nutritive matter round the germ cell. These divisions are called 'maturation divisions,' and until they are accomplished, fecundation is impossible. When a sperm cell after maturation comes into the neighbourhood of a germ cell, it penetrates into its substance, using the long *flagellum*, or tail-like process, with which it is equipped as an organ of locomotion. The two nuclei come into contact and coalesce, and we have thus a new cell with its sixteen chromosomes complete. This cell is the origin of the new being. It divides in two, and each part divides and redivides, different cells gradually differentiating themselves as muscular tissue, cartilage, blood-corpuscles, nerves, reproductive cells, and so forth, until the whole animal is built up and is ready for birth. One point of cardinal importance must here be noted. The originating cell, as we have seen, has eight of its sixteen chromosomes from one parent and eight from another. When division takes place, these chromosomes, as we have seen, split longitudinally, and the result is that each new cell gets exactly the same mixture of chromatin as that of the originating

cell—half from each parent. This principle of division is carried on throughout the whole process of building up the new being—every cell of the latter, down to the minutest details of its structure, containing an exactly equal quantity of hereditary elements from each of its parents.

It will be seen from the above account that the old conception of the germ-cell as a passive body, incapable of a change till 'fertilized' by a male or sperm cell, was altogether wrong. Both male and female cells prepare themselves for conjugation long before it takes place, and neither of them can be said to be a more active agent in fertilization than the other. Not 'fertilization' but 'fusion' is the key-word of the process. The mystical conception, as old as Plato, of the male and female as representing respectively the two halves of a complete being, turns out to be no poetic metaphor. As regards the essential features of reproduction, it is a literal fact.

If we now ask why and by what mysterious law all these exact and elaborate choric movements take place Weismann and his school refer us to "chemotactic forces," the nature of which is yet unknown. Chemotaxis means simply the effect of the *presence* of certain substances on vital organisms without specific chemical action. The really essential fact is that these special chemotactic forces are working *in living protoplasm.* Life is not the product or the

slave of any chemotactic forces, but their maker and steersman.

The following passage from a work of the late Prof. Geo. Rolleston may be pertinently quoted here:—

"There exists, as is well known, a tendency to resolve all physiological into physico-chemical phenomena: undoubtedly many have been, and some more may still remain to be, so resolved; but the public may rest assured that in the kingdom of Biology no desire for a rectification of frontiers will ever be called out by any such attempts at, or successes in the way of, encroachment; and that where physics and chemistry can show that physico-chemical agencies are sufficient to account for the phenomena, there their claim upon the territory will be acceded to, as in the cases we have been glancing at [certain animal poisons], and where such claims cannot be established and fail to come up to the quantitative requirements of strict science, as in the cases of continuous and of discontinuous development or self-multiplication of a contagious germ, and in some others, they will be disallowed."[1]

This was written in 1870. A generation later the attempt to reduce life to a physico-chemical phenomenon had not made much way, as may be judged by the following passage from Strasburger's Text Book of Botany:—[2]

"Vital phenomena are essentially bound up with the living protoplasm. No other substance exhibits a similar series of remarkable and varied phenomena, such as we

[1] Scientific Papers and Addresses, II, pp. 862–3.

[2] English trans., 2nd edition (1903), p. 159.

may compare with the attributes of life. As both physics and chemistry have been restricted to the investigation of lifeless bodies, any attempt to explain vital phenomena solely by chemical and physical laws could only be induced by a false conception of their real significance, and must lead to fruitless results. The physical attributes of air, water, and of the glasses and metals made use of in physical apparatus, can never explain qualities like nutrition, respiration, growth, irritability and reproduction."

And Wilson concludes his work by the admission that

"the study of the cell has on the whole seemed to widen rather than to narrow the enormous gap that separates even the lowest forms of life from the inorganic world."[1]

"The lowest *observed* forms of life" would have been a more exact way of stating the fact.

Many questions of detail will occur to the reader at this point, which he will find answered in the pages of Weismann or other investigators. Here we must confine ourselves to what has a distinct bearing on the objects of this study. One of the points which may be briefly touched on is the question how it comes that two germ cells, once having passed through their maturation divisions, cannot fuse and form a new being; nor can two sperm cells. Were this possible we might have 'self-fertilization,' and virginal conception or parthenogenesis, whenever two germ cells in the ovary of a female animal or

[1] THE CELL, p. 434.

in that of a plant happened to come into contact. But since the object of fusion is the union of (more or less) *unlike*, and not closely related, elements, we find that even when a kind of self-fertilization occurs, as in some plants, the sperm or pollen cells are differentiated visibly, and probably still more invisibly, from the germ cells. But, apart from this, the object of preventing the union of reproductive cells of the same sex is mechanically attained by a very curious device. The cell-organ by which division is carried out is the centrosome. But in the course of the two maturation divisions of the germ cell, that cell *loses its centrosome*, which seems to be absorbed into the protoplasmic substance of the cell when once its task is accomplished. No fusion of any number of such cells can therefore lead to any further change or growth, for growth is based on cell division, and the centrosome is the organ of division. The sperm cell, on the other hand, does not lose its centrosome; it retains it to form the organ of division for the new cell after conjugation. But, reduced as it is to little more than a bare nucleus without any envelope of nutritive matter, the sperm cell cannot support the intense vital activity called for in the initial stages of the life of a new being, and therefore sperm cells, like the germ cells, though for a different reason, would be incapable of mutual conjugation, even if the element of mutual attraction existed among them.

Another point of interest is the question of the determination of sex. The known facts afford a strong corroboration of the general theory of reproduction outlined above. It has not been ascertained, nor is it, perhaps, ascertainable, whether the sperm cells of the male contain in their chromatin a preponderance of male, while the germ cells provide chiefly the female determinants.[1] However this may be, it is certain that determinants which severally control the formation both of male and of female structure are *always* present in every combination of the sperm and germ cells, those which exhibit the greatest energy and vitality probably prevailing in the determination of the sex of the future being. This accounts at once not only for the cases (rare in the higher animals) of actual hermaphroditism, when the sex is really indistinguishable, but for the universal occurrence in all male animals of rudimentary female organs (such as mammæ) and in all females of rudimentary male organs. Both sets of determinants are always present; the more powerful prevail, but the weaker have a deflecting influence on the total result. When the primary sexual characters of the embryo are determined, they appear to communicate a stimulus which starts into activity the appropriate secondary characters, such as colouring and other modifications

[1] Against this view might be quoted the fact that the unfertilized eggs sometimes laid by the workers (imperfect females) of bee and ant communities always develop into drones.

not directly sexual. An extraordinary case, which I take from Beddard's ANIMAL COLORATION,[1] is that of a chaffinch which was found to have on the left side of its body the plumage of a hen bird and on its right that of a cock. On dissection the meaning of this freak of physiology was revealed. The bird was an hermaphrodite, having the female organs of generation on the left side of its body and the male on the right. Hermaphroditism is not in itself a very uncommon phenomenon in birds (though here it is a monstrosity, not, as in slugs and snails, a natural and useful condition); but the way in which in this instance it governed the distribution of colour is most peculiar; and of course it strongly reinforces Weismann's conception of distinct determinants for the various details of bodily structure.[2]

This brings us to the recognition of a *competition among determinants* which is an important, indeed a cardinal, feature in Weismann's theory of evolution. He makes, as I am forced to believe, an illegitimate and extravagant use of it, but the principle may

[1] Pp. 262–3. The bird was examined by Prof. Max Weber, of Amsterdam, and Mr. Beddard refers to the *Zoologischer Anzeiger* for 1890, p. 508, for Weber's account of the case.

[2] The now famous Mendelian Law of Inheritance, first discovered in 1865 by Mendel, an Augustinian monk and Abbott of Brünn, and completely ignored till the year 1900, when it was rediscovered by De Vries and others, is also strongly confirmatory of Weismann's analysis of the principle of heredity. According to this law it is possible, as it were, to isolate any particular characteristic of a species or even (if heritable) of an individual, and by a definite system of

really exist and be operative without furnishing the master-word to the riddle of organized being. The master-word, as I shall try to show, is nature's will to live. But before going fully into this argument, let us fix in our minds the *rationale* of those processes of elementary organic life which have been described in this chapter. Protoplasmic life may be supposed to have originated, and perhaps to be still originating, in certain molecular combinations of matter. In other words, the combination, when it took place, developed certain peculiar forces through which it was enabled to maintain itself and to grow, by the processes called assimilation and nutrition. These forces, then, were potentially present in nature before the molecules combined to evoke them. They are among the latent powers of life. They waited, ready to be called into action when the required external form should be arrived at in the play of molecular energy. Life first originated, no doubt, in unconnected and inconceivably small units

crossing to attach this characteristic *alone* to any other variety capable of crossing with the first. This means that inheritance is governed by separable units of formative energy. These units are Weismann's determinants. The discovery of the methods of turning this principle to practical account is obviously of great importance for agriculture and stockbreeding. The law has some inexplicable limitations which are now closely engaging the attention of biologists. It is impossible to enter upon the subject more fully here, but a good account of it will be found in Lock's RECENT PROGRESS IN THE STUDY OF VARIATION, and in a brochure, AN ADDRESS ON MENDELIAN HEREDITY, by W. Bateson, reprinted from *Brain*, pt. cxiv, 1906.

of protoplasm. Between the units thus formed and their combination into the elaborate structure which we now know a cell to be—packed as full of varied energies, it has been said, as an ironclad is of machinery—there is evidently a very wide gap. All we know is that when we have got the cell, we find it in possession of a complex apparatus for subdivision, which, taken together with the faculties of nutrition and growth, enable any one cell to multiply indefinitely by producing replicas of itself. To *life* and *growth*, then, has been added the faculty for *multiplication*. Here we strike on a veritable mystery. Why should any new movement ever take place? Why should a cell ever divide in two? We can only say that it is its property to do so.[1] It does so because it is alive. Did this property first arise as one of a multitude of aimless movements—the only one which ensured permanence and multiplicity to the organisms which exhibited it? If so, then Nature, at the time when life began on the earth, behaved in a manner most unlike that in which she behaves at present. If we are to interpret the processes hidden in the remote past by the light of what we see at present, we shall conclude that, at bottom, the will to live made molecular action—and the same force in-

[1] The actual stimulus which prompts the division is probably to be found in the disturbance of equilibrium which arises when the cell is taking in more nutriment than its digestive system can deal with. This, of course, does not explain why it should divide instead of dying of indigestion.

corporated itself in the combinations which originated protoplasmic life, ordered the structure of the cell, and gave it the need and the power to multiply. Nature is for ever changing, for ever straining after new life, after more life.

Having arrived at the cell with its powers of division, the next step was the power of conjugation between cells with their interchange of vital substance, bringing about, in Weismann's words, "a wealth and diversity of organic architecture which without it would have been unattainable." It takes place by means of physical energies, but the process is entirely inexplicable unless we assume that it exists to satisfy a need, a *Drang*, for life. And this need, although of course it displays itself in physical processes, is not in itself a physical process. At the very beginnings of structural life, if not before it, we are obliged to pass beyond physics in order to comprehend physical phenomena. Whenever we find an aggregate of living units, such as a *Pandorina* colony, living with a communal life which is other than the sum-total of the lives of the individual units, we are in presence at once of the necessity for a metaphysical conception, to render intelligible the unity in diversity which we perceive.

The response of living protoplasm to the stimuli it receives from the outside world is normally directed to the maintenance of the life and form of the organism. The response of what is called 'lifeless'

matter is of another nature; not because it is really lifeless, for if it were it would not respond at all, but because it has no organisms to protect and foster. We all know the nature of the action of gravity on Newton's apple. It was treated as a dead substance, like a stone, and gravity acted upon it as upon all other ponderable matter. But when it had fallen to the earth, had decayed, and one of its pips began to grow, the action of gravity began to be manifested in a quite different and very peculiar fashion. It has been ascertained by a series of ingenious experiments that gravity is the force which obliges the roots of a plant to sink downwards into the earth. This does not, of course, mean that the roots are drawn downwards by attraction of the earth, but that the pull of gravitation gives a certain stimulus to the cells concerned which makes them grow in that direction. Precisely the same stimulus communicated to the cells of the stem has the very opposite effect—these it causes to grow upright into the air and light. Thus the roots are, as it is termed, positively, and the stems negatively, geotropic. The substance of the root cells and of the stem cells is the same, the stimulus is the same, but the effects on growth agree in only one point, that they are respectively what the plant requires them to be. There is no doubt that if a species of plants were placed in such a position that it would serve them for the roots to grow upwards, then upward-growing roots

would eventually be evolved; in fact, this is actually the case in the lateral underground roots of certain mangroves which rise to the surface and become modified as breathing organs, and in the aerial roots of various orchids, etc.[1] When a change of habitat takes place calling for new developments of structure to meet new conditions, these developments are not, as a matter of actual observation, found to be mechanically 'selected' from a mass of random movements and modifications of tissue—they reach their goal, it is true, by a series of *gradual* approximations, but the goal is in sight from the beginning. In other words, *adaptability is a fundamental character of life.* Hence the fact that multicellular organisms which cannot, as a whole, fuse with others, adapt themselves to these conditions by the allotment of special cells for that purpose; while, again, the production of multicellular organisms is itself an adaptation to Nature's need for the higher organization of life.

"The botanist Reinke," writes Weismann, "has recently called attention once again to the fact that machines cannot be directly made up of primary physico-chemical forces or energies, but that, as Lotze said, forces of a superior order are indispensable, which so dispose the fundamental chemico-physical forces that they must act in the way aimed at by the purpose of the machine. . . . Organisms also [according to Reinke] are machines which perform a particular and purposeful kind of work, and

[1] See Strasburger, *loc. cit.*

they are only capable of doing so because the energies which perform the work are forced into definite paths by superior forces; these superior forces are thus 'the steers men of the energies.'"[1]

Weismann admits that there is "undoubtedly a kernel of truth in this view," but he is content with this perfunctory acknowledgment. His main efforts are devoted to the substitution of fortuitously developed "constellations" of molecular energy for any force which can be deemed to have the slightest tincture of intelligence or purpose. "In our time," as he writes, "the great riddle has been solved—the riddle of the origin of what is best suited to its purpose without the co-operation of purposive forces." The nature of the proposed solution can be best described and discussed in another chapter, when we shall be in a position to consider it in relation to the whole history of organic development from its origin in protoplasmic life to the evolution of species in plants and animals.

[1] The Evolution Theory, I, 402–3.

CHAPTER IV

THE MECHANICAL THEORY OF EVOLUTION: THE DARWIN-LAMARCK EXPLANATION

"Quelle est donc cette nature sujette à être effacée? La coutume est une seconde nature qui detruit la première. Pourquoi la coutume n'est elle pas naturelle? J'ai bien peur que cette nature ne soit elle-même qu'une première coutume, comme la coutume est une seconde nature."—PASCAL.

WE now approach the *arcana* of Evolution. The processes we have to deal with in this chapter are not, and probably never will be, the subjects of direct observation. All we can hope to do is to generalize from the results which have risen to the surface of life about the unseen forces from which they spring. The problem is to find (if possible) a generalization which will cover all the facts relating to that modification of natural forms, habits, and instincts which, when it reaches a certain point, means the establishment of a new species. We know that the thing happens, but we shall not understand *how* it happens until either the mechanism of the process is laid bare, or until it is clear that we are in presence

of an agency not entirely definable in terms of mechanical action.

The fixity of species is maintained by a number of conditions, chief among which must be reckoned the law of reproduction by conjugation, with the consequent intermixture of numerous different lines of descent. From one point of view conjugation, as Weismann so often insists, greatly favours the adaptability of the organism to new and varied conditions of life, inasmuch as it results in the mingling together in each individual of a great number of varied determinants. But when the conditions are constant, conjugation has also the obvious effect of constantly reabsorbing, as it were, any heritable abnormalities which may occur in individuals or the species, and bringing them back to type. An individual possessing some abnormality of structure will be most unlikely to find a mate possessing the same abnormality—the mate will be either an ordinary individual or will possess, if any, some quite different variation. Their descendants will, therefore, usually show more resemblance to the normal type than to the one abnormal parent, and in their descendants again, for the same reason, the abnormal feature will be still further reduced, until finally it disappears. It is only by the careful selection of mates extending over many generations that pigeon-fanciers, to take one prominent instance, are able to establish a new type. Left to mate uncontrolled among them-

selves we should never have had the great variety of breeds which have been produced by the art of the fancier from the original rock-pigeon. The small variations which form the starting points of his operations would, under natural conditions, have soon been resolved into the normal type. What is it in nature, then, that sometimes appears to play the part of the intelligent breeder and to urge the plastic forms of life into new moulds?

The goal of the breeder is some new form which it pleases him to produce, either for its use, or its beauty, or for its mere singularity. The goal of nature, at least the apparent and immediate goal, is the adaptation of each species to the circumstances of its life. And the first thing that strikes the investigator is the way, often indeed not perfect, but usually most impressive in its apparent thoughtfulness and care, in which the organs of plants and animals are fashioned to secure the most favourable results. But all this is the result of development. The whale is a creature excellently adapted for its present mode of life, but we know that it was once a furry land animal with four legs; the legs are all there still, in modified or rudimentary form, and the fur appears at a certain stage of embryonic development. When we ask, How did this extraordinary transformation come about? what we really mean is, How did the determinants composing the chromatin

in the reproductive cells of the original land animal so come to alter as to produce the characteristics of the whale? For new species can only be evolved by means of structural modifications *capable of being transmitted by inheritance*; and nothing can be inherited except through the action of the determinants. A modification which does not affect the reproductive cells has no significance in the evolution of species.

To this question Darwinism has given us our choice of two answers, which may be termed respectively the Darwin-Lamarck and the Darwin-Weismann theories. Lamarck explained the origin of species by the accumulated effect of the inheritance, through many generations, of modifications acquired by the exercise, or the disuse, of the modified organs. Observing that living protoplasm responds to demands upon it (thus, for instance, a muscle when systematically exercised attracts more nourishment from the blood and grows stronger, and callosities form to protect the skin of the hands of a manual worker), he assumed that modifications so acquired might be transmitted by inheritance. Each new generation, then, would start with a slightly better equipment in this particular respect than the former one had when it started; and so, by slow degrees, a new organ, or one markedly differing from the original form, might be built up. The world, since protoplasmic life first appeared upon it, has gone

through many changes, and has always presented a vast variety of climatic and other conditions, calling for the most varied types of organic structure. As animal life gradually spread over the earth and sea, the effort to cope with the different conditions it met with would gradually, by the combined action of exercise, of disuse, and of heredity, produce multitudes of different types; and these are what we know as families, orders, genera, and species. When a species is fairly well adapted to its surroundings and way of life it may go on indefinitely without change. But should any members of it be obliged to migrate, from scarcity of food or any other reason, to some new locality where somewhat different conditions prevail, structural alterations would soon begin to appear to suit those new conditions. Thus the giraffe, if we could trace its ancestry back, would probably be found to have originated in some animal not differing from the vast majority of quadrupeds in the relative proportions of its fore and hind quarters. But some members of this original species—or the whole species, owing to some change in their surroundings — found themselves obliged to rely largely for food on leaves growing at a considerable height. They stretched up to reach them, and a prolongation of the bones of the neck (the giraffe has only the usual seven cervical vertebræ) and of the forelegs would ensue, especially in the young; this prolongation would be handed on by inheritance,

and so by degrees the new type of animal would be evolved. The horn of the rhinoceros, the antlers of the stag, the canine teeth of beasts of prey, the flat grinders of ruminants, the flippers of the whale, the proboscis of the honey-feeding butterfly, the jaws of the ant or the beetle, and a host of other adaptations which seem obviously to owe their origin to the exercise of their functions, occur to the mind in confirmation of this theory.

Besides Adaptation, we have what appears the strikingly confirmatory case of what is called Co-adaptation, where the variation of one organ or structure in an animal puts a strain upon other parts, which accordingly respond by auxiliary adaptations. Such co-adaptations are numerous in every animal structure, and, as we cannot suppose them to have all originated simultaneously and by chance, the conclusion drawn by Lamarckians is that one was produced by use, and, in the course of its development, produced the others in the same way. A typical case is that of the Irish elk. The enormous antlers of this beast, sometimes weighing a hundredweight, must have needed (besides other structural changes) a cervical ligament of immense size and power to support them, and from the peculiar structure of the cervical vertebræ it is demonstrable that such a ligament must have existed. What more natural than to suppose that the antlers were developed by fighting wild beasts of prey, combats between male elks,

etc., and that then in their gradual growth, as the species was evolved, the ligament and the bony structure associated with it responded to the increasing strain. That is exactly what would happen in an individual. We have only to assume the heritability of modifications acquired by use to understand how these co-adaptations became constant characters in a species.

Not less apparent cogency for the argument for modifications by use have those cases where the modification has been apparently due to disuse. It is well known that living creatures found in the total darkness of great limestone caverns, like those at Kentucky, are blind, through imperfections of one kind or another in the organs of sight. But the rudimentary structures which remain tell us that these creatures had ancestors which were once fully equipped in this respect, and which had wandered into the caverns from the sunlit outer world. Thus the case of a crab has been noted, in which the stalks on which a crab's eyes are set were preserved, while the eyes had disappeared: it is, as Darwin observes, as if the stand of a telescope had been retained while the telescope itself had gone. Sometimes the eyes of cave-fishes are covered with a horny layer, sometimes the whole structure is atrophied and withered. But never is an animal found under these conditions which has retained its power of sight. The conclusion seems obvious. In individuals, a muscle or

other organ is known to strengthen and develop by use and to atrophy by disuse. As use and disuse appear to be invariably accompanied by precisely the same effects in the species as in the individual, and as there seems no way of accounting for this by any known physiological law without assuming that modifications acquired by the individual are transmitted to its progeny, the case for the inheritability of such modifications appears, at first sight, irresistible.[1]

So matters stood when Darwin's ORIGIN OF SPECIES carried the argument for evolution a long step further. Accepting fully the views of Lamarck, Darwin attempted, by his doctrine of Natural Selection, first to reinforce those views, secondly to explain much that they could not be made to cover. It is plain that *if we assume the existence of a severe competition for livelihood among the members of a species*, any favour-

[1] The subject of degenerated and lost organs is very fully treated by M. Edmond Perrier in his TRAITÉ DE ZOOLOGIE, pp. 325 *sqq.* It may be noted that animals which are *fixed* usually lack eyes, even in light. In the depths of the sea, where total darkness reigns except for the phosphorescence emitted by certain animals, it is found that some creatures have completely lost their organs of sight, while others have them extraordinarily developed. Those which have lost them are the walkers (*Crustaceæ*); those which show an exceptional development are the swimmers. This goes to show that the needs of the animal, rather than the external conditions, are the determining cause.

Cave fishes are all extremely sensitive to light, which affects them disagreeably, even when the optic nerve is wholly destroyed. See Armand Viré, 'La Faune Actuelle des Cavernes,' *Revue des Idées*, March 15, 1905, and LA FAUNE SOUTERRAINE DE FRANCE, 1900.

able variations of structure or instinct which may occur among certain members of the species will give their type an advantage over the normal type in the struggle for existence. They will, on the average, live longer and produce more offspring. Ultimately, as the struggle for life is always most severe among nearly related organisms, which seek a living from the same sources, the less perfectly equipped type will be extinguished, and so on, until a species exhibiting the most complete form of adaptation has been evolved. The variations on which Natural Selection has to work are produced, according to Darwin, not only by the exercise of particular organs as in Lamarck's theory, but also and more potently by "innate variations" originating from unascertained causes in the reproductive cells. Variations, it is indisputable, are always occurring; probably no two members of any species exactly resemble each other. Among low and primitive organisms, such as the *Foraminifera*, Dr. W. B. Carpenter (I quote from A. R. Wallace's DARWINISM) found, on careful examination, the range of variation so great that characteristics typical not merely of species but of genera and even of orders were liable to vary,[1] while at the other end of evolution, in man, to give only one instance, Mr. J. Wood is stated by Darwin to have observed no less than five hundred and fifty-eight variations in the muscu-

[1] A. R. Wallace, DARWINISM, chapters III. and XV.

lar structure of thirty-six subjects examined.[1] The cause of these variations is often quite obscure, but it is certain that some kinds of them are capable of arising as the natural response of the organism to changed conditions of food or habitat. Conditions such as these, affecting the whole constitution of the organism, have been proved capable of affecting the reproductive cells, and thus of giving rise to hereditary characteristics. Natural Selection, then, by preserving and encouraging the better fitted as opposed to the less fit, acts as a spur to the Lamarckian principles of development by exercise of function, while it also lays hold of and intensifies all kinds of other favourable variations occurring either casually or in consequence of change of habitat, and weeds out the types in which such variations happen to be unfavourable. According to Darwin, therefore, given (1) constant variations of structure arising from use, disuse, or from other known or unknown causes, (2) the capacity to transmit by inheritance these variations *whether innate or acquired*, (3) a constant struggle for existence among organisms both against each others' competition and against the general conditions of life[2]—given these simple data, the secret springs of evolution are laid bare, and the vast complexity of natural forms upon the globe is adequately accounted for without

[1] ORIGIN OF SPECIES, chapter II.

[2] Sexual selection—the competition of males and females for their mates—is merely a form of natural selection, and need not be specially dealt with here.

calling in the agency of special creations. But variations are the starting-point in the process: Natural Selection can originate nothing—it can only act on what is presented to it by some quite different force. The relative parts played by the various agencies at work are, with characteristic moderation of statement, thus described by Darwin:—

"On the whole I think we may conclude that habit, use, and disuse, have, in some cases, played a considerable part in the modification of the constitution, and in the structure of various organs; but that the effects of use and disuse have often been largely combined with, and sometimes overmastered by the natural selection of innate variations."[1]

To explain evolution, then, we must first explain *the occurrence of appropriate variations*, strong enough and widespread enough to maintain themselves against the constant reducing influence of promiscuous intercrossing, and they must be variations *capable of being transmitted by inheritance.* This, we now see, is the true field of the inquiry.

The new factors introduced by Darwin into the process of evolution—Natural Selection and Innate Variations—were destined in our day to have the whole weight of the argument for evolution suddenly thrown upon them. The inheritability of variations acquired by the individual through use and disuse

[1] ORIGIN OF SPECIES, chapter V.

when subjected to fresh investigation by the younger school of biologists has turned out to be open to the gravest doubts, both theoretically, on account of the great difficulty of reconciling it with what has now been ascertained of the nature of the reproductive mechanism in plants and animals, and also on the score of a closer consideration of the facts commonly adduced as evidence for the law. To take these points separately: The reproductive cells in every living creature are now believed to be formed directly from the reproductive cells of its parents. They are not a product of the organism in which they find themselves. They are nourished by its blood, and are therefore liable to be affected by anything which produces a broad general effect on the constitution of the being in whom they are lodged, but it is difficult to see how special modifications of individual parts of that being could affect them so as to influence the determinants in the direction of reproducing that modification. How, for example, could the habit of grubbing for roots in an animal of the pig tribe so affect its reproductive cells as to ensure the birth of an offspring with callosities on their snouts? The physiological mechanism by which such a result could be produced seems hardly conceivable—at any rate no one has yet offered a plausible conception of it. Of course if the *fact* were indisputably proved one would only have to accept it, and endeavour, if possible, to discover the why and

how. But the fact, which once looked so solidly established, is taking on a more and more insubstantial appearance in the light of closer investigation.

The argument against Lamarckism rests on the basis (1) of artificial experiment, (2) of observation of nature under normal conditions.

As to the evidence from experiment, opinions fluctuated for some time—Darwin was disposed at one time to deny, at another to admit the alleged proofs it offered. In the present day opinion is overwhelmingly against the validity of these proofs. The cases where artificially produced mutilations are said to have been inherited have, when investigated, turned out to be by no means as clear and trustworthy as was supposed, nor can one place much reliance on a few cases of striking coincidence such as are certain to occur from time to time.[1]

The adverse instances are very clear indeed. Chinese girls are never born with abnormally small feet. Jews are not born circumcised. Among tribes where tattooing is practised, no traces of this embellishment are ever found to be inherited. If it is a physiological law that the disuse of an organ not only atrophies it in the individual but (by inheritance of the atrophy) eliminates it from the species, there is no apparent reason why this law should not operate

[1] See Eimer, ORGANIC EVOLUTION (Eng. trans.), pp. 173–184, for a full discussion of the question from the Lamarckian standpoint.

in cases where the organ is artificially removed. Yet it rarely or never seems to do so. Experiments upon animals, such as breeding for many generations from mice whose tails have been cut off, have never resulted in producing a clear case of inherited mutilation. A strong presumption is therefore raised that the effects apparently due to use and disuse under natural conditions (as in the eyeless fishes of the Kentucky caves) must be set down to some other cause. The queens in colonies of ants and bees have never exercised the functions of workers for thousands of centuries, yet they transmit these functions unimpaired.

There is, indeed, a case often referred to in this connexion which must be here mentioned. Dr. Brown-Séquard found that by injuring or compressing the sciatic nerve in guinea-pigs epilepsy was produced, and that the descendants of animals so injured had a marked tendency to epileptic fits. This is undoubtedly a very significant and important fact in biology, but it gives no support to the Lamarckian theory. What is inherited by the guinea-pigs is not the injury to the nerve but the pathological condition resulting therefrom. It remains to be discovered how, precisely, this takes place, and the experiment may end in illuminating a very obscure region in physiology, but on Lamarckism it has no bearing at all. A better case is that of atrophy of a toe, which is said to have been inherited in

consequence of its original production by severance of the sciatic nerve, but, again, what is inherited is not an actual injury but an effect of it. It is clear, however, that bodily conditions of a large and comprehensive kind produced naturally or artificially in an individual may have an effect on the reproductive cells, especially when the nervous system is affected.

Coming to the observation of what happens under natural conditions, we are struck at the outset by the fact that the inheritance of acquired characteristics, if it works at all, must work under some system of salutary control and not as a blind physiological law. For if each generation starts with some measure at least of what the former generation had acquired, and adds to it by its own activity, then all acquired characteristics would ere long attain a monstrous development, and the species would perish under them. But nothing of the kind is observed to happen. The continual use of the muscles in the labouring classes has not made men stronger than they were thousands of generations ago. The habit of handling the spade and hoe has never produced a peasant child born with callosities on its hands. The horn of the rhinoceros, which on Lamarckian principles we must regard as developed by the gradual increase of a callosity formed by grubbing for roots, does not grow beyond a certain size, however the species may go on grubbing. The Lamarckian law, then, if it has any real effect at all, can only express half

the truth about the action of heredity on acquired characteristics. As the column of water in a fountain hovers about a certain height, so the action of heredity in the accumulation of the effects produced by the use of organs seems to have a limit beyond which it cannot pass. May it not be that heredity is really as false an expression for the phenomenon as the popular superstition about 'water seeking its own level' is for the upspringing of a fountain?

The cases of co-adaptation, where one organ appears to be developed by use and others by the use of that, as in the case of the Irish elk referred to above, are met by instances just as striking where the elements of modification by use cannot come into play. Weismann mentions the case of the ingenious brush arrangement on the anterior legs of the bee, which the insect uses for cleansing its antennæ. Two adaptations are here developed—a little semicircular notch in the leg, set with small bristles, and a movable projection or flap used for pressing the antenna into the notch as it is drawn through. The bee, no doubt, would naturally try to clean its antennæ with its fore-legs, but how could this process develop the special arrangements referred to in the hard or scaly covering of its limbs? It is not until the shell of the insect has grown quite hard and incapable of further vital changes that the arrangement comes into use. Again, the stridulating noise produced by the legs of the grasshopper is due to

serrations occurring on different joints of the limb. Serrations on one joint would in no way tend to develop them on the other, but rather the contrary, yet there they are, in harmonious co-operation. If Nature can obtain these effects, as she does in numberless instances, without the aid of Lamarck's principle, we cannot help asking whether that principle is ever operative at all.

The three instances which we shall next consider seem to offer very serious obstacles to the Lamarckian theory.

A modification of structure caused by the special use of a certain organ takes place in probably over 90 per cent of the whole human race, male and female. The records of art, of language, and the evidence of actual remains, tend to show that the habitude in question, with the attendant modification, goes back to very ancient, even perhaps to palæolithic times.[1] I refer to the preferential use of the right hand and the enlargement of structure thus brought about in the right hand and arm. Every right-handed adult man and woman shows

[1] 'Right-handedness and Left-brainedness' by D. J. Cunningham: the Huxley Lecture for 1902. Printed in the *Journal of the Anthropological Institute*, Vol. XXXII, pp. 273–95. I may refer also to a brochure by Dr. Geo. Sigerson, F.R.U.I., CONSIDERATION OF THE STRUCTURAL AND ACQUISITIONAL ELEMENTS IN DEXTRAL PRE-EMINENCE, Dublin, 1884. Dr. Sigerson believes that primitive man was ambidextrous, and that 'dexterity' is a case of specialization of function, and has supported this view by a novel and interesting line of pathological observation.

this enlargement of bony and muscular structure. The origin of the habitude does not concern us here. Let us suppose it due, as Dr. D. J. Cunningham suggests, to "a transmitted functional pre-eminence of the left brain,"[1] which is larger than the right, and which governs the movements of the right side of the body. However this may be, it is clear that if bodily characteristics acquired by exercise are transmissible by inheritance the new-born child of right-handed ancestry ought to show some appreciable preponderance in weight and size of the right over the left limb. There could hardly be a more crucial test of the validity of the Lamarckian principle. What do the investigations of the dissecting-room reveal? I shall quote the two most recent authorities who have studied this interesting question. Dr. Cunningham, in the lecture already referred to, writes:—

"Although the matter has not been investigated so fully as to place the question outside the region of dispute, the evidence at our disposal distinctly favours the view that at birth the two upper limbs start upon their individual duties equally endowed in so far as strength of muscle and size of bones are concerned. Both in mass and weight the two limbs are to all intents and purposes similar at birth, and the preponderance in bulk and strength which later on distinguishes the right arm is acquired during life, and is caused by the greater amount of work it is called upon to perform."[2]

[1] *Op. cit.*, p. 285. [2] *Ibid.*, pp. 284–5.

Dr. T. G. Moorhead, Chief Demonstrator in Anatomy in Trinity College, Dublin, after giving the results of the researches of various other inquirers, writes:—

"From this mass of conflicting evidence I am forced to the conclusion that no real differences exist. . . . After weighing as a whole the limbs of eight foetuses I was unable to detect any constant difference."[1]

These results appear to conflict most seriously with the theory of the transmissibility of acquired modifications.

Every one is familiar with the fact that species of animals which are preyed on by others, or which require to be inconspicuous for the purpose of preying, are very apt to take the colour of their habitual surroundings. Individuals of the same species will even differ according to their special habitat. Perhaps the most marvellous instances of this kind of adaptation are to be found in certain tropical butterflies, such as the Indian butterfly, *Kallima paralecta*, here illustrated. We have here, painted on the butterfly's wing, the picture of a leaf belonging to a shrub which it frequents—a picture, when seen under natural conditions, capable of baffling all but the closest inspection. The different parts — the midrib, the lateral veinings, the little blotches and spots which represent patches of mould or drops of water, even

[1] *Journal of Anatomy and Physiology*, Vol. XXXVI, p. 401. 'On the relative weights of the right and left sides of the body in the foetus.'

the outer contour of the wing itself—all form an harmonious whole composed of related parts which

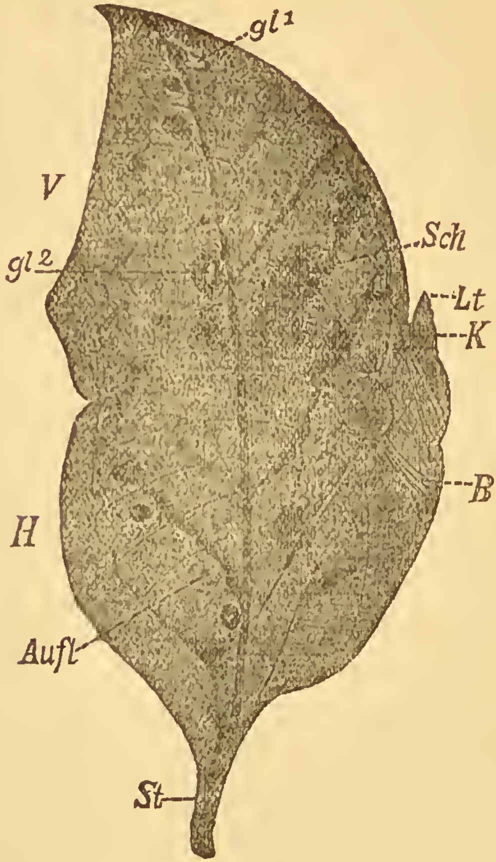

FIG. 3.

Kallima paralecta, as it appears at rest, with wings closed. From Weismann's THE EVOLUTION THEORY.

K, the head; B, the limbs.

have separately no meaning or use. They certainly did not all appear in full development at the same time. Nor could any one of them, if it appeared first, have

exercised the smallest influence on the appearance of the others, as the antlers of the elk were supposed to have influenced the development of the *ligamentum nuchæ*. The early stages must have been anticipatory of the later ones, but exercise could have had nothing to do with the result from first to last. The butterfly never practised looking like a leaf. Nor can any large chemical and elemental influences have been at work. If nature is capable of producing such effects as this without the agency of Lamarck's principle, are there not excellent grounds for seeking for some other agency which will cover all the phenomena alike?

Finally let us take the case of the slave-owning 'Amazon' ants, *Polyergus rufescens*. Here we have a case which at the first blush looks like a perfect picture of an evolutionary process conducted on the principles of Lamarck's theory. These ants, it may be supposed, were originally of the ordinary type of that industrious and respectable insect, but they were led by the weakness of some of their neighbours of another species to make occasional attacks on them for the purpose of carrying off their immature brood, the *pupæ*, as food. Some of these *pupæ*, near maturity at the period of their capture, would come out while stored-up in the nest of the conquerors, and when they did so would immediately set about doing the household work of the hive as if they were at home. *Polyergus rufescens* ultimately

became aware that a life of aristocratic leisure awaited him if he only captured enough *pupæ* of another species of ant to do his work. He accordingly confined himself entirely to piratical expeditions of this nature, and in the course of time underwent a moral and physical transformation of a most remarkable kind. The ordinary ant instincts have disappeared in this variety. They do not make their nests, they do not gather stores, they do not mind their young, they do not even feed themselves—an Amazon ant will perish of starvation in the presence of food if there is not a slave ant to put it into his mouth. But they fight ferociously in their slave-raids, and the form of their mandible has changed to suit their mode of life. It has become a pair of sabre-like nippers, excellent for slaying a foe, but ill-adapted for carrying objects and other industrial occupations. Corresponding changes have taken place in the head and in the chitinous and muscular structure.

We have before us, then, what would seem to an uninformed observer, a striking picture of the acquirement of a certain bodily form and a certain set of instincts by use, and the total loss of other traits by disuse, and of the fixing of these characters in a species by heredity. Yet the picture is altogether an illusion. However we are to explain the facts—of which more anon—we cannot do so by Lamarckism, for the simple reason that the peculiar

instincts and bodily structure of the Amazon ants are confined to the so-called 'worker,' or in this case 'soldier,' caste, which are sexless, and incapable of reproducing their kind. If these were the individuals which originally started the slave system among the species, they could not possibly have transmitted the modifications, moral and physical, which they acquired. The queen-ants, which normally are the only fertile ants, transmit them, but do not possess them, and neither do the drones.

The case of these mysterious communities of insects, composed largely of neuters which do the work of the community but do not reproduce their kind, was one of the difficulties in the way of Darwin's theory of evolution which, he said, staggered him every time he reflected on it.[1] It is not surprising, therefore, that this difficulty came to be the battlefield, or a main position thereof, in a most interesting and illuminating controversy on Natural Selection *versus* Lamarckism, waged between Mr. Herbert Spencer and Dr. Weismann in the years 1893–4.[2] Spencer considered the inheritance of

[1] ORIGIN OF SPECIES, chap. VI.

[2] 'The Inadequacy of Natural Selection,' Herbert Spencer. *Contemporary Review*, February and March, 1893.

'Prof. Weismann's Theories,' Herbert Spencer. *Contemporary Review*, May, 1893.

'The All-Sufficiency of Natural Selection,' Aug. Weismann. *Contemporary Review*, September, 1893.

'A Rejoinder to Prof. Weismann,' Herbert Spencer. *Contemporary Review*, December, 1893.

THE ROMANES LECTURE FOR 1894, by Aug. Weismann (Frowde).

acquired characteristics a factor in evolution of the very first importance; and so, indeed, from his point of view it is. "Either," he declared, "there has been inheritance of acquired characteristics, or there has been no evolution." Met by the case, among others, of the slave-making ants, his explanation is substantially as follows: It was not the workers (soldiers) which originally acquired military traits, but the queens, the fully developed females, which lost them. There was once, as every one admits, a time when all ants, bees, etc. were sexually mature. There were only males and females. At this stage, possibly, the Amazon ants were already predatory. It was *then* that they may have acquired the military habits and structure, which they were then able to perpetuate by inheritance.

How, then, did the queens lose these traits? "From the queens," replies Spencer, "they have slowly disappeared by inheritance of the effects of disuse." The obvious and unanswerable rejoinder made by Weismann and his followers was that Spencer had only shifted the difficulty to another ground—from the workers to the queens. If the queens (and drones) lost the military characteristics by disuse, how do they come to transmit them unimpaired to the workers? It is the very essence of Lamarckism that whatever modifications are produced by use or by disuse shall be transmissible by inheritance.

In this controversy, however, there was another string

to the Lamarckian bow. Worker-ants, bees, etc. are imperfectly developed females. They have four or five egg-tubes where the queen has two hundred, but they cannot be fertilized by the drones. It occasionally happens, however, that these neuter insects do lay a few eggs. These unfertilized eggs always develop into drones. One of these drones might, it was suggested, now and then fertilize a genuine queen, and thus hand on the traits of the worker from which it sprang. But apart from the fact that an occasional occurrence of this sort would hardly suffice to maintain the worker-characteristics unimpaired throughout the ages, there is the decisive answer, as Weismann points out, that we know at least one species of ant in which the evolution of a neuter caste is absolutely complete, for the workers of *Tetramorium caespitum* possess no egg-tubes at all. Yet the transmission of characteristics from queens and drones who never exercise them to workers who cannot pass them on, goes forward in this species of any ant just as in any other.

Nature, therefore, while doing in the case of these insect communities exactly what she appears to be doing elsewhere by the accumulation of acquired characteristics, must, in reality, have been working on entirely different lines. If we can discover what those lines were, they will cover the apparently Lamarckian cases as well, but the Lamarckian principle certainly will not cover these.

In the next chapter we shall review the alternative explanation offered by Darwinism, the explanation of Weismann; and we shall see whether Spencer was not as successful in demolishing it as Weismann was in showing that, if evolution exists at all, some other basis must be found for it than that on which it was so largely rested by Herbert Spencer.

CHAPTER V

THE MECHANICAL THEORY OF EVOLUTION: THE DARWIN-WEISMANN EXPLANATION

"Chance guides all things: mind and forethought must call it God alone!"—MENANDER.

"IN the end," writes M. Edmond Perrier, "every imaginable theory of evolution must lead up to one or other of two absolute doctrines, essentially antagonistic to each other. Either the inheritance of acquired characteristics must be admitted in its full scope (*dans toute sa généralité*), or else we must believe in the predestination of protoplasm, developing by virtue of its own internal forces. But in the latter case we pass from the domain of pure science to enter that of metaphysics."[1]

We have now to consider the most conspicuous attempt made in recent times to escape from this tragic dilemma.

[1] 'Lamarck et le Transformisme actuel': MUSÉUM D'HISTOIRE NATURELLE, CENTENAIRE; VOL. COMMEMORATIF, 1903, p. 508. M. Perrier adds that the metaphysical alternative "est, en effet, à quoi le professeur A. Weismann, de Fribourg, a été conduit." This, I think, can only be M. Perrier's way of saying that he finds Weismann unintelligible, for Weismann's ostensible object is certainly to steer between the Scylla of Lamarckism and the Charybdis of 'metaphysics.' With what success he attempts this feat we shall see.

If the acquired and inherited variations of the Lamarckian theory drop out as a contribution to the explanation of evolution, we are reduced to two forces only—*innate*, or germinal, variability of offspring, and natural selection. Indeed it might be said that we are reduced to variability alone, since natural selection can do nothing until suitable variations are presented to it. The suitable variations do, however, turn up, and the question is, what causes them? The real difficulty for the school of biologists who, like Weismann, "assume the mechanical theory of the world to be correct," is how to reconcile the aptness and apparent purposefulness of these variations with any mechanical theory.

> "We are justified in inquiring," writes Weismann, "whether the assumption of 'chance' germinal variations, which we have hitherto made with Darwin and Wallace, affords a sufficient basis for selection. Osborn says very neatly in this connection, 'We see with Weismann and Galton the element of chance; but the dice appear to be loaded, and in the long run turn "sixes" up. Here arises the question, What loads the dice?'"[1]

What loads the dice? There is the great question in which the realms of biology and of philosophy meet each other! Through that borderland no definite frontier has ever been traced, for in thought as in matter the saying is true that natural groupings have nuclei, but no boundaries. It is all the more essential

[1] The Evolution Theory, II, p. 78.

that men of science should understand philosophy and its methods, and that philosophers should understand science. It is to be feared that at present the second of these desiderata is much more fully realized than the first.

However, we have to see now what Weismann, protagonist among contemporary biologists of the mechanical theory of the world, has to answer to the crucial question which he has allowed Osborn to set him.

The problem is to discover how innate, germinal variations can come about, of such a nature as to adapt an organism with striking accuracy to its surroundings and way of life, without our assuming either (1) that the exercise of function had any influence in causing heritable variations, or (2) that they were caused by any non-mechanical power, which, so to speak, had in view the objects which they fulfil. For the variations are to be regarded, on Weismann's theory of life, as completely *fortuitous* in respect of the objects they serve. How, then, do they come to serve them, in most cases, so admirably well?

The general nature of Weismann's explanation may be summed up in a curious illustration given by him in THE EVOLUTION THEORY.[1] Let us suppose, he says, a snow-field surrounded by precipices on all

[1] II, p. 330 *sqq*.

sides, but with a narrow track leading away from it at one point. Scattered about on the snow-field are a number of persons. A sleigh is now projected among them from some outside point. Each person, when the sleigh comes near him, gives it a push, but he has no object in pushing it anywhere in particular, and simply sends it flying off in whatever direction he chances to be looking. What will happen under these circumstances? After more or less bandying about, the sleigh will, in the vast majority of cases, fall into one of the abysses round the snow-field and be lost. But another is then launched on to the snow-field, and then another and another without end; and so, at last, it may happen that a series of pushes will take place which will send the sleigh over the narrow track to its goal.

The goal is supposed to represent some condition to which the organism (the sleigh) has to adapt itself. The random pushes which it receives are the multitude of variations constantly occurring in the reproductive cells. Most of these variations have no decisive tendency, favourable or unfavourable. If a series of unfavourable ones should occur, leading to some development which markedly impairs the chances of the organism for success in life, it, or its line of succession, dies out, and the unfavourable variation is, therefore, not perpetuated. This is illustrated by the sleigh going into the abyss. But if a favourable variation occurs, and is increased till

it reaches 'selection value,' *i.e.* till it gives the organisms possessing it a distinct advantage over others in the battle of life, then this favoured type will ultimately, by the action of natural selection, drive out the less favoured, and will establish itself as the sole representative of the species. Having reached this level, of course the same process will go on further indefinitely.

Before criticizing this conception of evolutionary processes, we must inquire into the vital point of how the variations, the random pushes given to the sleighs, ever rise to such intensity as to have selection-value, and to make head against the influence of intercrossing. The explanation is certainly ingenious, but is so purely hypothetical and has an air so fantastic that it has commended itself to very few students of biology. Weismann would have us suppose that the determinants of which the hereditary substance in the reproductive cells is made up are carrying on with each other an incessant struggle for nutriment. If one of them succeeds in getting a little more than its neighbours it thereby grows stronger, and is able to attract still more nutriment to itself, and to impoverish those around it. It is thus launched, as it were, on an ascending scale, and will go on automatically if the variation caused by it proves favourable to the species. If it proves unfavourable (which *ex hypothesi* it is just as likely to do) its career will be put a stop to by the extinction

of the line of descent which inherits this variation. Weismann's theory of "Germinal Selection" is therefore simply an application to the reproductive cell and its contents of the Darwinian principle of Natural Selection.

The theory is one which plainly makes immense demands upon our faith. As regards the existence of a continual competition among the determinants, there may be reason to accept it, but hardly in the Weismann sense. Suppose two parents to unite, one healthy, well-nourished, full-blooded, the other starved and weakly, it is very likely that, in the resulting offspring, other things being equal, the determinants coming from the well-nourished frame will be seen to have surpassed in potency those from the weakly one. For the determinants are living protoplasm—they depend on nourishment derived from the blood of the organism in which they are lodged, and they are capable, no doubt, of being well-nourished or ill-nourished or possibly over-nourished, according to the constitution and history of that organism. But this is a very different thing from supposing that one determinant can begin to grow in *the same cell* at the expense of another, when both are absolutely embedded in an ocean of the same nutritive matter. There is not—of course in the nature of things there cannot be—a particle of evidence for the supposition. It is a pure imaginative hypothesis, and on the face of it a most improbable

one. It is difficult to believe that it could ever have been adopted save as a desperate attempt to break through the ever-narrowing ring of evidence which is forcing investigation more and more towards a non-mechanical explanation of the processes of life. But even if it were true, what is gained by it? "Appropriate variational tendencies," writes Weismann, "not only *may* present themselves, they *must* do so, if the germplasm contains determinants at all by whose fluctuations in a plus or minus direction the appropriate variation is attainable."[1] But why *must* they? There is no 'must' about Chance, unless one extends its operations to infinity. Why is it so certain that the inequalities of nutriment, on which hereditary variability is supposed to depend, must necessarily run the gamut of all possible variations? There is no 'must' in this theory, except that it is the last ditch of the "mechanical conception of the economy of life." It 'must' be true—or that conception must quit the field.

Were evolution to depend on the occurrence, by pure chance, of a few appropriate variations among a vast multitude of indifferent or disadvantageous ones, is it conceivable that we should find in nature anything like the infinite wealth of closely and beautifully adapted structure which is actually present? In particular, how are we to account for the cases in which a number of parts are so modified as to work together

[1] The Evolution Theory, II., 346.

in harmonious co-adaptation? Each of these parts, according to Weismann, originates quite independently of the others. Take the case of the Indian leaf-butterfly already referred to.[1] The first beginnings of the midrib on Weismann's theory had nothing to do with the rest of the rib, nor had any of the veinings with this, or with one another; and the contour of the leaf, sending out a little projection like a stalk *exactly where the midrib starts*, originated quite independently of that marking, and equally so of the leaf it mimics! To explain co-adaptations like this on Weismann's theory is really much the same as to suppose that a picture could be painted by simply plastering the scrapings of a palette on a canvas, if only one continued the process long enough. And the marvel in question, the co-adaptation of various parts, has not been attained once or twice but, to a greater or less degree, in *every* organism possessing any structural complexity.

The difficulty, of course, has not escaped Weismann. His explanation depends on some conception of the potentialities of conjugation and intercrossing which I confess I cannot understand. He finds the key to the mystery in the mingling and constant recombination of determinants from different individuals produced by promiscuous intercrossing. "It is only through amphimixis [conjugation] that simultaneous harmonious adaptation of many parts becomes pos-

[1] See p. 83.

sible."[1] But surely this continual mingling and recombination would, *primâ facie*, be just as likely to break up co-adaptations already forming as to give rise to new ones? Amphimixis, as we have seen, is one of the most potent forces against which the evolution of a new species has to contend. Evolution has to make head against the constant tendency of intercrossing to obliterate individual distinctions. True, if parents exhibiting the same heritable variation unite, their offspring will have that variation in a strongly marked form, and will transmit it further. But this, to be of value for evolution, presupposes the same variation occurring simultaneously in a number of individuals within reach of each other. Weismann had indeed good reason to ascribe to the action of intercrossing "a wealth and diversity of organic architecture otherwise unattainable," but were it not supplemented by an architectural instinct of nature, the only architecture attainable would be that of the child when it empties its bricks on the floor.

Consider the theory of germinal selection in the light of the following very curious case.[2] Most people have seen an example of the kind of spectacles having what are called bifocal lenses. Each lens is divided across the centre, and the focal lengths of

[1] THE EVOLUTION THEORY, II, 264.

[2] I take this from J. T. Cunningham's SEXUAL DIMORPHISM, p. 16.

the upper and the lower halves are different. They are intended for persons who see indistinctly both at near and at far distances—the upper half of the lens is used for looking at distant objects and the lower for reading, etc., so as to avoid the inconvenience of having a different pair of glasses for each requirement. Now there is a fish, named *Anableps* (the Uplooker), living in estuaries on the east coast of South America which actually has its eye-lenses constructed on this principle. The pupil of the eye is divided laterally by prolongations from the iris. The significance of this extraordinary arrangement is that the fish is in the habit of swimming near the surface, and often has its eyes wholly or partly out of water, presumably to look out for attacks from birds of prey. The upper half of the eye has become adapted for vision in the air and the lower for vision in the water.

According to Weismann, the habits and needs of the fish could have had no influence whatever in producing this peculiar adaptation as an inherited characteristic of a species. Any other fish or mammal would have been just as likely as *Anableps* to begin the development of a bifocal eye. How does it come, then, that from the thousands of species of eyed animals one, and one only, possesses this bifocal eye, and that precisely the one which so greatly needs it? Weismann's answer would doubtless be that, in the case of other creatures, Natural Selection would not

have acted in protecting the individuals which possessed the bifocal eye and penalizing those which did not. But can we imagine that this principle acted very strongly when the bifocal arrangement in *Anableps* was in a mere rudimentary stage, as it must at first have been? And should we not occasionally see at least traces of the arrangement in the eyes of other creatures, if its full development in *Anableps* was merely the result of Natural Selection laying hold of and perfecting an originally quite fortuitous variation?

A case still more curious and convincing occurs in connexion with the hermaphroditism exhibited by a whole class of animals belonging to many different orders, but alike in the one respect that it is specially desirable for them to have both sexes comprised in the same individual. These are animals capable only of sluggish movement, the different sexes of which have therefore some difficulty in finding each other out. Terrestrial snails and slugs are an example. All these creatures are double-sexed; any two snails which meet can conjugate, since each can act either as male or as female at will. Oysters are another instance, though in this case the two sexes follow each other at different periods in the life-history of each individual. Clearly, this faculty gives to snails and slugs twice as many opportunities of reproducing their kind as if the sexes were distinct. It is certain from general biological considerations that they were

distinct originally. One can easily understand how, if any small group of the original species from which all the present tribes are descended, happened to throw up these bisexual peculiarities, their progeny would multiply faster than the rest and might ultimately exterminate them by the operation of natural selection. *But exactly the same might be said of any other tribe of unisexual animals.* Any of these might, *a priori*, on the "mechanical conception of the economy of life," be just as reasonably expected to develop bisexuality; for no one supposes that there is any physical connexion between sluggishness and hermaphroditism, or swiftness and distinction of the sexes; and the causes which have operated to extend and confirm the type in sluggish and sedentary animals would have the same effect in swift ones. Yet this remarkable adaptation occurs just wherever there is special need for it; there always and there only. What mechanism can account for such a phenomenon as this? No; the dice are loaded. Nature gains her end slowly and not without hesitations and failures, but the phenomena are wholly unlike the results of the play of uncontrolled and fortuitous forces. Imagine a blindfolded archer shooting arrows upwards, downwards, and all around him in every direction as it may take his fancy. There is, unknown to him, a target some distance off. If he went on long enough it is conceivable, though by no means necessary, that some arrow would hit

the bull's eye. But the facts plainly point not to the above analogy, but rather to an aim at a desired object. Some of the arrows miss, some light near the mark, others hit it precisely. The flight, on the whole, is in the right direction, as the immense proportion of complete or partial successes plainly proves.

The two pillars of Weismann's theory of evolution are *germinal variation* and *natural selection.* The one is supposed to originate ceaseless changes of structure, the other to eliminate those changes which are useless[1] or unfavourable and to foster and confirm the favourable. We have seen, if the foregoing considerations are sound, that fortuitous variations do not provide the material with which natural selection can build up a universe of organic life like ours. We have now to turn our attention to the other prop of the system and to inquire whether natural selection can play and does play the part which Darwin and his school assign to it in the economy of nature.

Natural selection is supposed to depend for its efficacy on the existence of a state of strenuous competition for nourishment, or for the avoidance of foes, in the type out of which the favourable

[1] Useless structures and organs are regarded by Weismann, and I think with justice, as in some degree unfavourable. They make demands on the organism for nourishment, and are thus in the position of non-productive members of a working family.

variations emerge. But in recent times the fact of any such competition has been gravely doubted. Let us look back to the beginnings of animal life in the world. The first primitive animal organisms found themselves swimming in a boundless sea of nourishment and had no foes at all! Yet they developed into higher and higher grades of life. Competition did not aid in the development of these higher grades—it was they which ultimately created the state of competition. What Nature then achieved without competition she is equally able to perform now. Even now when the earth is swarming with varied life competition plays a much smaller part than was taken for granted in the first flush of Darwinism. Creatures of the same type but on different grades of organization, like the hive-bee and the humble bee, are constantly found side by side, drawing their nourishment from the same sources, but each holding its own without difficulty. Facts like these were not unobserved by Darwin, who met them by the supposition that competition came chiefly into play at exceptional periods, during a drought, an inundation, a severe winter, or the like, in which the less fitted members of the race perished wholesale. But, as Kropotkin, in his interesting work, Mutual Aid among Animals, has remarked,

"If the evolution of the animal world were based exclusively, or even chiefly, upon the survival of the fittest during periods of calamities; if natural selection

were limited in its action to periods of exceptional drought, or sudden changes of temperature, or inundations, retrogression would be the rule in the animal world. Those who survive a famine, or a severe epidemic of cholera, or small-pox, or diphtheria, such as we see them in uncivilized countries, are neither the strongest, nor the healthiest, nor the most intelligent. No progress could be based on such survivals—the less so as all survivors usually come out of the ordeal with an impaired health, like the Transbaikalian horses just mentioned, or the Arctic crews, or the garrison of a fortress which has been compelled to live for a few months on half rations, and comes out of its experience with a broken health, and subsequently shows a quite abnormal mortality."[1]

Kropotkin's book shows good reason to believe that the principle of mutual aid and support plays at least as great a part in the animal world as does that of mutual competition and extermination.

That the competition of organisms, animal and vegetable, for nourishment and for protection may favour certain types, and depress or even exterminate others, is of course indisputable. We see it when the Japanese worker and the Californian meet in industrial rivalry on the Pacific slopes—we see it when the willows planted by New Zealand rivers destroy the weed which infested them, by absorbing the nourishment from the river-bed on which it lived.[2] What we have to consider, however, is the efficacy of competition in giving predominance and per-

[1] *Op. cit.*, p. 73. See Appendix B.

[2] Wallace, DARWINISM, p. 24.

manence to a type differing but slightly in the initial stages from that of the rest of the species, and differing but in a very few individuals. We have to consider, in fact, whether natural selection is not a consequence rather than a cause of evolution. On no mechanical theory of evolution can we suppose that the first leaf-markings of the butterfly, *Kallima paralecta*, were either at all pronounced in their mimicry, or that they originated simultaneously in any large group of the original species from which *Kallima paralecta* sprang. Therefore, with very small advantage in the way of protection from enemies, and with the constant and powerful influence of intercrossing ever tending to obliterate the distinctive leaf-marks, how could natural selection alone enable the new, the mimicking type, to assert and develop itself, as it has done not only in this particular species of butterfly but in hundreds of species of the *Lepidoptera* and other insects?

"A considerable initial resemblance," writes Mr. Beddard in his most valuable though somewhat chaotic work on this subject,[1] "may be fairly set down to other causes [than natural selection]; because it is impossible to believe that a slight move in the required direction would be of sufficient importance to serve as material for the action of natural elimination."

The most convinced Darwinian will hardly deny that the problem involved in this case is a serious one.

[1] Animal Coloration, p. 252.

Another singular fact to be noted in this connexion is the "conclusion arrived at by the study of mimetic butterflies in all parts of the world—that the females are far more liable to assume this method of defence than the males."[1] An instance in point, which has been the subject of much discussion, is that of the yellow and black swallow-tailed butterfly, *Papilio meriones*, found in Madagascar. The island is supposed to be the original home of the species, and here both sexes are much alike. On the mainland of South Africa, however, while the male has undergone the very slight transformations represented by the species *P. merope* and *P. cenea*, the females imitate closely three different species of the *Danais* butterfly which is protected by its disagreeable taste from the usual enemies of the tribe, and which is altogether unlike in shape and coloration to the swallow-tail. "The new forms," writes Mr. Poulton, "have arisen at so recent a date that many of the intermediate stages can still be seen, while the parent form has been preserved unchanged in a friendly land, where the keener struggle of continental areas is unknown."[2] The significance of such a fact as this is obvious. If mimicry arose from fortuitous variations of colouring and of form, males alone might show it in some species, females alone in others, and both in yet others, but it is difficult to understand how we could

[1] Poulton, THE COLOURS OF ANIMALS, p. 238.
[2] *Ibid.*, p. 237.

arrive at the actual condition, and find it either common to both sexes or practically confined to the female. If, on the other hand, mimicry and other similar adaptations are ultimately to be interpreted as the common response of the species to the attack of its foes, it is quite natural that the female, as the egg-bearer, the most important factor in the continuance of the species, should be specially protected. It is probable also that she is most in need of protection, as her functions may render her rather more exposed than the male to attack. That natural selection cannot have been the dominant factor in the case we are considering seems clear; for how could it have acted at all without a somewhat vigorous weeding out of unprotected forms? And, in that case, what would have become of the unprotected males of the species?

Difficulties of this kind have, in different cases, been raised again and again since the publication of the ORIGIN OF SPECIES, and have had to be answered so often that there seems good *prima facie* ground for doubting whether they have ever really been answered at all. The strongest advocates of the pure mechanical theory are obliged, as we have seen, to admit that the drift of contemporary scientific opinion is to place little reliance on casual variation and natural selection and to look for the driving force of evolution in other directions.[1] In the intro-

[1] See p. 7, note 2.

duction to Strasburger's TEXT BOOK OF BOTANY[1] we find this important passage :—

"The tendency is to assume the existence of a development of the organic world due to original, innate capabilities of the living substance and not dependent on selection. The origin of the large subdivisions of the animal and vegetable kingdoms, the 'Archetypes,' would be due to this sort of evolution. These archetypes have been, and are still, continually influenced by the environment, and, by their reaction to external conditions, organisms become more or less directly adapted. . . . The progressive evolution of the archetypes, as well as the direct adaptations to external conditions shown by them, is independent of selection. The latter does, however, exert an influence on the process of evolution of the organic world, though to a much more limited extent than was formerly supposed."

It is clear that in these *original innate capabilities of the living substance* we have a power which alone *may* fully account for the evolution of the organic world, though natural selection can emphasize and hasten its action. Its nature and limits are still undetermined. Biologists are very chary of expressing this power save in terms of chemistry and physics. Men of science are afraid—sometimes I venture to think even morbidly afraid—of opening any door by which the fantastic horde of arbitrary dogmas and superstitions which they have cast out with so much toil and peril might find their way back into the temple of Knowledge. But philosophy must

[1] Eng. trans. revised from fifth German edition, 1903, p. 3.

warn them that in shutting out all forces that cannot be weighed and measured in a laboratory they may be shutting out life itself. And those who strenuously insist on reducing nature to a mechanism often find themselves obliged to let in the mysterious life-force by some more or less clandestine entry in order to make their mechanism work. Thus Nägeli, the originator of the theory of heredity which Weismann has developed, attributes the phenomena of growth and evolution not to natural selection but to "internal forces."[1] He disclaims for these forces any but a physical and chemical significance; but Professor Eimer, in spite of all disclaimers, cannot get rid of the suspicion, well justified in my opinion, that there is in these forces, as conceived by Nägeli, something purposeful and teleological—admit them, he says in effect, and who knows what we shall next be asked to believe?[2] Yet for Eimer himself we find that, as Schopenhauer says, "the lotus of physics is rooted in metaphysics." Twice in his work on organic evolution, he refers with approval to the view of "our profound philosopher, Oken,"[3] who regarded all existing beings as members or organs of some vast and transcendental organism whose

[1] MECHANISCH-PHYSIOLOGISCHE THEORIE DER ABSTAMMUNGSLEHRE. 1884.

[2] See especially ORGANIC EVOLUTION, pp. 52, 3.

[3] ORGANIC EVOLUTION, pp. 225, 433. Eimer is a believer in the inheritance of acquired characteristics; hence Oken's conception, *taken literally*, offers him a ready method of disposing of the ant-problem dealt with on p. 85, *sqq*.

development conditioned theirs. Eimer even makes a somewhat daring application of this principle to a concrete instance in the physical world, one which we have already referred to, the problem of the inheritance of qualities in ants, bees, etc., when these qualities are possessed and exercised only by individuals who cannot transmit them.

"We must regard," he writes, "the different forms of bees, queens, drones, workers, as *discontinuous organs of one whole*, which have been evolved from a single indifferent ancestral form. . . . Only thus can we explain to ourselves the fact that the peculiarities of the workers, notwithstanding that they do not reproduce, are inherited."[1]

When we are asked to believe in physico-chemical laws of such a nature that they enable the habits of life of a worker-ant or bee to react upon the germ-cells of the queen, just as the exercise of an organ, on Lamarckian principles, affects the reproductive cells of the creature to which it belongs, it becomes plain enough that for modern investigators the so-called mechanical and the so-called psychic conceptions of the universe are really running out at the same point. The gulf between these conceptions, which seemed to yawn so widely after Darwinism, was a mere illusion, arising from a point of view now left behind.

To resume the argument of the foregoing chapters. We have seen that at the basis of all theories of evo-

[1] ORGANIC EVOLUTION, p. 268.

lution lies the fact of the responsive powers of living protoplasm. *But what does it respond to?* That is the question of questions. To put it accurately in relation to the process of evolution we must ask, To what do the determinants in the germinal cells of plants and animals respond? To what call did unicellular organisms respond when they first began to interchange chromatin with each other? To what, when they began to divide and form new organisms? To what, when multicellular organisms began to specialize certain cells for reproduction, and these cells to mature themselves for fusion by throwing out half their chromosomes? And when the higher plants and animals came on the scene, reproducing their kind under conditions which make strongly for the fixity of species, how are we to interpret the response of protoplasm when we see organs and structures melt away, and others grow, giving rise to the innumerable types which yield us the existing world with its overwhelming richness and variety of life? Weismann tells us that the response is only to differences in the amount of nutriment obtainable by the various determinants of the germ cell, and has but a fortuitous connexion with the results attained. We have seen the inadequacy of this theory, in the light of the many adaptations such as that of which the fish, *Anableps*, with its bifocal eyes, and the double sexual organs of terrestial snails, are types. Lamarck and Darwin, besides the belief in fortuitous variation,

held that heritable characters arise from exercise of function. Innumerable cases can be quoted in favour of this explanation, but we have seen instances in which it is absolutely untenable, and yet where the required response takes place just the same. The influence of light and colour tells on the colouring of animals, and impartially protects them when they are preyed upon, or helps them to secure their prey; and this influence is frequently explainable by chemical or electric agencies originating in the environment of the animal, acting on the blood, and thus influencing pigmentation of the skin,[1] but chemistry is helpless to account for the manner in which nature shapes the contour of the wing of a tropical butterfly and paints upon it the veinings of a leaf, or protects a harmless fly by giving it a resemblance to a stinging one, or protects a caterpillar by making it look like a vicious and dangerous reptile. Yet all these protective arrangements are evidently, at bottom, facts of the same order. Protoplasm lives and responds not only discretely in the lowest unit perceptible by the microscope, but collectively in the connected groups of these units called multicellular organisms, and in the disconnected groups of these organisms called species. It really responds not to the exercise of function or to the play of physical forces, but to vital tendencies of the organism. There seems an expansive force in nature

[1] See Eimer, ORGANIC EVOLUTION, p. 135 *sqq.*

which, though working strictly under the dominion of physical laws, is capable of using the combinations brought about by those laws for the preservation and development of life. It is in love with life, it is ever pressing toward action and self-realization, and all roads are one to it if they lead to that end. In it are included the very chemical and physical agencies which it obeys, and also that something beyond which eludes the analysis of the laboratory.

How it acts, under what conditions, what limitations, why here in one way, there in another, are questions of profound interest, the fringe of which philosophy has hardly begun to touch. Nor is philosophy yet in a position to do more, for the scientific conception of nature is but a recent birth of thought; much remains to do in the collection and organization of the facts with which the framework must be filled in, and a philosophy which does not keep closely in touch with scientific fact can have no message for the modern world. But it does seem possible to discern, and it shall now be our endeavour to set forth, in broad outline, certain principles of deep significance from which we may obtain an answer to the question: What can we learn from the physical universe that has a bearing on the spiritual life of man?

CHAPTER VI

THE DIRECTIVE THEORY OF EVOLUTION

"Who is there that cannot distinguish between the actual cause of a thing and that without which the cause could never be a cause?"—Plato, PHÆDO.

THE problem set at the close of our first chapter was to find a fit explanation of the guiding power apparent in natural phenomena. We have not been able to interpret this guiding power either in terms of conscious, intelligent contrivance or in terms of blind, mechanical law. The investigations which followed have led us up to another explanation. We have seen that the vivifying, transforming, progressive power in nature may be conceived as a power of Response. Every particle of matter, organic and inorganic, has this power. Every particle of matter can react and respond to some stimulus. The more it can respond to, the higher it is in the scale of being. And we have found, as I think, one constant and universal stimulus to which both the fixity of nature's laws and the plasticity of her mysterious substance may be conceived as a re-

sponse. This stimulus is the call of Life. Stimulus and response taken together constitute the directive force in obedience to which the world unfolds itself in the evolutionary process. We have been led to interpret nature as the concrete expression of the will to live, a will which for the first time comes into rational consciousness in man. Having brought this conception, I hope, into clear light, it is the aim of the present chapter to illustrate and enforce it in more detail, and thus to gain a secure foundation for the application of the conception to the more strictly human problems with which we have ultimately to deal.

It must be confessed that the existence in nature of any directive power transcending and utilizing the mechanical forces and relations of matter, call it 'vital force,' the 'hand of Providence,' the '*X*' of evolution, or what one will, has never readily been admitted by scientific naturalists. They feel that, if once admitted, it offers a prompt and facile explanation of every difficulty, and is available as the cheap resource of all those who study nature with a view to the grinding of their moral or religious axes, rather than to the discovery of truth. Those who feel obliged to believe in the existence of some such power are therefore bound to be more than ordinarily on their guard against all loose thinking. They must not be content with vague generalities, but must be prepared to indicate as exactly as

possible the distinction existing between the mechanical and the non-mechanical or transcendental agencies in nature. It does not follow that one's account of the matter will prove to be exactly true in every detail. One must always speak in such matters with that wise reservation of Socrates, "If this be not the truth, something of the kind is." But it is not allowable to fall back on that "something of the kind" until an attempt has been made definitely to establish the "kind," by searching into the inmost heart of the fact.

The fact here is the responsive power of living protoplasm. It will be well to examine it first in its operation in an individual organism before we consider it in relation to the species.

Reaction or response of a chemical and mechanical type takes place alike in dead matter and in living organisms, but certain stimuli will induce action in an organism which they could not possibly induce in a mineral. For in every cell, as Reinke well says, there are a chemist and an architect who guide its energies, and who have something quite different from chemistry and physics in view. Consider the following case. Every tuber of a potato plant is covered with a light skin composed of a corky substance intended to protect the internal structure from injury. This skin is produced by the action of the surface cells of the tuber. Chemically and physically these cells are just the same as the cells in the

interior of the tuber. But the interior cells do not produce this corky substance, because it would be injurious to the plant if they did. The cells below the surface of the tuber, though they are by no means secluded from the chemical influences of the earth around them, behave quite differently from those actually in contact with the earth.

Now let us take our tuber, slice it in half, and replace it in the earth again. If we look at it again in a few days we shall find that the interior cells, now exposed by the cutting, have done what they could not or did not do before—they have produced a layer of skin to cover the exposed surface of the tuber just as if they had been surface cells from the outset.

This kind of response seems to take us quite out of the region of chemical and physical action as understood in the case of inorganic matter. It is a response directed to maintaining as far as possible the life and form of the organism, a thing which mere chemical action in mineral substances never does.

It may perhaps, however, be argued that the actual contact with the earth has a possible chemical stimulus which is not communicable to cells even a hair's-breadth below the surface, and that the cells laid bare by slicing react as they do simply because they are exposed to this stimulus. Let us take, then, another common and typical case of response to altered conditions in plant life.

The taproot of a tree, as we have seen,[1] grows straight downwards towards the centre of the earth in obedience to the stimulus given by the pull of gravitation. The same stimulus impels the stem to shoot upwards, and the other roots and the branches to grow more or less laterally. New growth always takes place at the extreme tip of the shoot or root. Lay bare the taproot, cut away this growing tip, and that root can grow no more; no fresh tip charged with vegetative vitality can form itself over the scar. But mark what happens! The nearest lateral root, instead of pursuing its normal course, straightway begins to bend downwards and takes the place of the mutilated taproot. Similarly if the leading shoot of the stem is nipped off, the nearest lateral branch will turn upwards. In this case the lateral root or shoot has not been subjected to any new influences whatever, or at least to none of a chemical or physical nature. Yet it responds, not to anything affecting itself, but to the needs of the organism as a whole.[2]

[1] p. 62.

[2] "It is," writes Wilson, "becoming more and more clearly apparent . . . that Schwann went too far in denying the influence of the totality of the organism upon the local activities of the cells. It would of course be absurd to maintain that the whole can consist of more than the sum of its parts. Yet, as far as growth and development are concerned, it has now been clearly demonstrated that only in a limited sense can the cells be regarded as co-operating units. They are rather local centres of a formative power pervading the growing mass as a whole" (THE CELL, pp. 58, 9).

What Prof. Wilson, absorbed like most scientists in the consideration of ponderable and visible masses, assumes to be "absurd" is of

None of the forces which living organisms have in common with minerals will account for this kind of response.

How are we to represent to our minds the nature of the forces which apply to the innumerable cases of which the above is a type? Reinke, who deals exhaustively with this question, conceives the vitality of living things, manifested in growth, development, and reproduction, as lodged in what he calls "Dominants."[1] These dominants exist in all parts of the organism, and govern those processes which ordinary physical laws do not explain, *i.e.* the phenomena which are specifically vital. They are not themselves chemical or physical energies, but they guide these energies toward the fulfilment of the objects of life.

"Dominants," he writes,[2] "are those secondary[3] forces in the organism whose existence we recognize in their operations, but which we cannot further analyse. Thus I understand under this form that principle of control which takes effect in every organism and which sways whatever energies are available just as men use tools and machines. Since this control is manifold in its manifestations, one is obliged, when seeking for a technical designation for it, to express it in the plural. The dominants are therefore an

course the very thing which he is proving to be a fact. The whole can be not merely the "sum" but the synthesis of its parts.

[1] Die Welt Als That., chap. xxiv. [2] *Loc. cit.*

[3] Kräfte zweiter Hand. The primary forces are the chemical and mechanical forces, the secondary are those which control and guide these for certain ends.

abstraction ; a symbol for phenomena, just like the conceptions, Force, Matter, the Atom, etc.: the term has been devised in order to provide a short explanatory description of certain essential processes.

"I therefore repel the objection, if anyone should make it, that the dominants are a fiction, a troop of ghosts with which I have peopled the cells and organs of animals and plants. They are, in some sense, merely a paraphrase of the description of certain phenomena, a personification of forces not to be ranged under the conception of energy—the *directive* impulses in the animal and vegetable world."

To continue Reinke's explanation: Two different classes of dominants are to be recognized. These are the operative and the formative. The former control principally the chemical activities of the organism, as when a plant turns inorganic substances into sugar, albumen, etc.; the latter are the invisible architects in the organism who control its form and structure. Both are heritable, and are capable of modification within certain limits. Closely bound up with matter and energy, they are neither matter nor energy. They can be indefinitely multiplied and (to all appearance) totally destroyed. Their multiplication does not abstract energy from other known sources, nor does their destruction restore it; they do not therefore come (visibly) under the law of the conservation of energy. They operate entirely within the framework of natural laws, and can only utilize what energies are available for them at the given time and place. Every cell has its dominants; and as an

organism is a synthesis, not a mere aggregate, of cells, so its individual dominant is a synthesis of the dominants of its parts. The evolution of species, like the development of an embryo, is under the control of dominants. The conditions under which they work for this end are material and physical; these conditions can, to a great extent, be ascertained and defined, but the driving force lies beyond scientific analysis.

Such is the conception of Reinke; and taken as he presents it, that is to say, merely as a kind of working hypothesis, as a means of making intelligible a vast and various mass of phenomena, it seems admirably suited to its purpose. It remains to add, though Reinke himself does not say so, that this conception of the dominants appears to harmonize remarkably with what has been put forward in regard to cell-structure and reproduction. The chromosomes are probably the material vehicles of the dominants; in fact, Weismann's determinants seem to be the same thing under another name, though Weismann conceives them rather from the point of view of the scientist, and Reinke from that of the metaphysician.

We have now arrived at an intellectual conception under which to range the phenomena (not the ultimate nature) of vital response. Let us apply it to the question of evolution. The following passage

from Henslow's ORIGIN OF PLANT STRUCTURES[1] may serve to introduce this part of our discussion:—

"The question . . . resolves itself into this: which probability or hypothesis do *the facts* of the case seem to favour most, viz. that *indefinite* variations arise from some assumed internal causes, of which variations only those in harmony with the environment survive, and are said, therefore, metaphorically, to be selected by it; or is it that the external forces of the environment excite the variability which is inherent in plants, and call into action the responsive power of the protoplasm in the various species of plants, which thus *all* tend to put on the same, or similar, or at least adaptive and *definite* variations of one sort or another, so that there are *no* indiscriminate or wasted variations[2] at all? I know an abundance of facts which support the latter contention, but none whatever in illustration of the former hypothesis."

Here is the action of the dominants in evolution placed in the clearest light. To prove the truth of Professor Henslow's contention it is necessary not only to study organisms in situations where they have been established for many generations or centuries, but to see how they behave on transportation to a new kind of environment. The cases which can be adduced are numerous and convincing. Thus Mr. D. Dewar reported to Mr. Henslow that on

[1] Pp. 9, 10. The italics are Prof. Henslow's.

[2] This statement taken literally is, of course, quite too sweeping. Professor Henslow clearly means here by "variations" those alone which are important enough to have selection-value, favourable or otherwise. Insignificant variations are always occurring.

introducing at Kew a cress, *Arabis anachortica*, found in cave-like situations in the Alps, and having very thin, papery leaves, it turned, when raised from seed, into a different species, *Arabis alpina*. The change took only three generations to accomplish.[1]

Bulbous roots have it among their functions to store up moisture for the plant they belong to. Haeckel has shown that the grass *Poa bulbosa*, on being cultivated in moist soil, almost lost its bulbous character. Contrariwise we find that many plants not bulbous elsewhere are observed to be so when growing on the dry Karoo in South Africa.[2]

Spines on a plant are usual accompaniments of dryness in soil or atmosphere. *Ononis spinosa* has an excessively spiny variety, termed *horrida*, which is found on maritime sands. Grown in very rich moist situations, it gradually loses its spines and they ultimately disappear entirely.[3]

In the animal world experimental cultivation is not at all so easy, but the facts observed all go to support the view that the response to environment is direct and definite. The small shrimp-like crustacean, *Artemia salina* is a case frequently quoted. It lives in salt pools by the Black Sea, and it has been found that by breeding it in water of which the salinity is gradually decreased, the creature in a few generations assumes a type commonly assigned not

[1] Henslow, ORIGIN, etc., p. 102.
[2] *Ibid.*, p. 80. [3] *Ibid.*, p. 40.

merely to a different species but to a different genus —*Branchipus stagnalis.*[1]

Perhaps the most remarkable instance of a transformation produced by the influence of environment is that of the Mexican water-newt, Axolotl. When gradually accustomed to live on dry land, this creature usually throws off its gills, develops lungs, alters the shape of its tail, and takes on all the characteristics of a terrestrial instead of an aquatic reptile. This transformation does not take generations to accomplish—it happens in one individual in the course of a few weeks or months. When found in the terrestrial form, the Axolotl is called *Amblystoma tigrinum*, and is classed among the salamanders. Its progeny are then *Amblystomas*, and they do not naturally revert to the Axolotl type, although under certain circumstances the steps of this amazing transformation can be retraced. The Axolotl is not a larva in the ordinary sense of the word, for it is not an imperfect creature; it is sexually mature, and in most cases, in nature, probably never develops into an *Amblystoma*, nor do the progeny of the *Amblystomas* begin as Axolotls. What we have here is probably, as Weismann plausibly suggests, a case of a species which has almost reached the stage of evolution from an aquatic into a terrestrial form, so that a sufficient impulse from its environment suffices to send it over the border. Internal forces have evidently prepared

[1] A. R. Wallace, DARWINISM (1890), p. 427.

the way for the change, and the process does not in the least resemble the mechanical selection of suitable characters from a crowd of fortuitous variations.[1]

The case of the Porto Santo rabbit may also be quoted in this connexion. In the year 1419 the young born of a tame Spanish rabbit were put ashore on the island of Porto Santo near Madeira. No rabbits then existed on the island. They have since increased enormously, and have quite changed their appearance. They have acquired a peculiar colour, are very small, rat-like in shape, have nocturnal habits, and are noted for their extreme wildness. They no longer pair with the European rabbit. The case was observed by Haeckel, who styled the new species *Lepus Huxleyi*.[2]

Cases like the foregoing show the organism affected during its process of transformation by large elemental influences, and the response to these influences is so familiar that often it does not surprise us. We veil the real mystery of the process by talking of the chemical and other physical properties of protoplasm which render this response possible. But when we come to the protective mimicry of

[1] Marie v. Chauvin, 'Ueber die Verwandlungsfähigkeit des mexikanischen Axolotl.' *Zeitschrift für wissenschaftliche Zoologie*, XLI, p. 385. See also THE CAMBRIDGE NATURAL HISTORY, *sub voce*.

[2] Haeckel, HISTORY OF CREATION (English trans.), I, p. 150.

stinging insects by stingless ones, of leaves by butterflies, and so forth, these physical explanations manifestly fail us. The explanation which assumes the building up of these extraordinary resemblances bit by bit, through natural selection working upon a multitude of fortuitous variations, fails us as completely. It would be difficult to accept it if only a single species of insect showed these mimetic markings. The unlikelihood of their production by mere chance in the case not of one but of hundreds of species of butterflies, flies, and caterpillars is stupendous, and defies all calculation. It must, we repeat, always be borne in mind that, if chance variations are all we can postulate, these variations must at first be confined to one or few individuals, and that the influence of intercrossing would always be at work to obliterate individual peculiarities before they could develop to the point of affording any protection worth mentioning. We are bound, therefore, so far as I can see, to conclude, first, that these mimetic markings originate not in individuals but in the species as a whole, and are an expression of the communal life of the species; secondly, that they are a real and direct response to the external conditions of danger from attacks of birds, etc., and of protection afforded by deceiving these foes through mimicry of something which they do not care to attack. They can only originate in the dominants of the reproductive cells, and there, where undoubt-

edly forces and affinities of which we have no conception are ever at work, the initial changes take place. These changes, no doubt, take place by forming new combinations or modifications of existing dominants. The directive force must have something to work on. It does not follow that because some things are possible to it therefore all things are. It is not to be expected, for instance, that human beings, although it would be a great advantage to them to fly, could ever develop wings, like the conventional angels of mediæval art, for that would violate the essential character of the archetypal form. It is true, however, that life is ultimately responsible for the material with which it works as well as the directive agency that breathes through it. This point is of importance and must be made perfectly clear. The view of cosmic action here put forward does not contemplate 'interventions' in the order of nature from a source outside it. There never was a moment when, if *law* prevailed, one result would take place, while another result actually does occur in obedience to some mysterious life-force. No; it is the life-impulse which makes the law, obeys it and utilizes it. One can never say, "Such and such would have happened if the life-force had not been in action, but, as it was, the event was so-and-so"; for if it were not in action nothing would ever happen at all—the Universe would be the Eternal Nothing. One might as well speculate as to what would happen in a game

of whist if nobody held a trump. The voluntary limitations under which nature works resemble, in the conception here put forward, the playing of a game, say a game of 'Patience,' where there is only one player, who plays the game with himself. There are laws to be obeyed, combinations which are necessary, but a guiding force can take advantage of the conditions as they arise and lead them to a certain end. If there were no laws and conditions there would be no game. If, on the other hand, matter were absolutely plastic life could not realize itself; nature's game would be finished ere it was begun. A concrete illustration may, while we are on this topic, serve to suggest the kind of limitations under which nature seems to work.[1] During the last century or so the African elephant has been ruthlessly hunted down for its ivory, and since rifles and expanding bullets came into play the process of extermination has been greatly hastened. Elephants are now, I believe, protected by law over a great part of South Africa, but if it were not for this the species would at present be in considerable danger of extinction. The case is very like that of the *Kallima* butterfly and similar mimetic forms before they acquired their protective markings. Now, how might we expect nature to attempt the protection of the elephant? Doubtless by increased fleetness, cunning, watchfulness, capacity of one kind or another for concealing

[1] See also pp. 15, 16.

itself from hostile observation. But could we look for any such development as, for example, a deterioration in the quality of the ivory? Suppose, for example, the interior structure of the tusk were to become spongy and cellular instead of being dense. The tusk, if coated with hard enamel, might be almost if not quite as useful to the elephant, but it would cease to be of any use for most of the purposes to which it is now applied by man. The protection would be most effective; yet we know that nothing of this kind can possibly take place, though intrinsically the process would be far less remarkable than the painting of the butterfly's wing. It cannot take place because it would either imply a supernatural knowledge on the part of the evolution-dominants of the elephant tribe of the *reasons* why it is hunted, or a conscious supervising and co-ordinating power above nature, a manlike Deity, omnipotent and omniscient, such as Paley assumed; to both of which explanations the actual processes of nature stand uncompromisingly opposed.

It is much easier to say what the life-impulse is not than what it is. I cannot, for my own part, conceive it as personal or conscious, in the sense in which I feel myself a conscious person. If we ask, Has it or has it not the quality of intelligence? we shall find both the affirmative and the negative answers equally hard to square with the facts. Our

own intelligences working in a mysterious relation to a bodily organism are perhaps fundamentally incapable of forming a clear idea of the nature of the cosmic intelligence which is revealed to us in the outside world, "like the dim view of a country seen in the twilight, with forms half extricated from the darkness, with broken lines, and isolated masses."[1]

But those who find it difficult to believe that anything having the nature of intelligence is at work in the physical world might reflect on the striking analogy which that world offers to a certain sphere where it is quite certain that the human spirit, including its intelligence as well as its appetites and instincts, is the governing power. Social institutions are a product of the human spirit. Yet the development of these institutions is extraordinarily like that of the functions and structures of an animal or vegetable organism. The value of Mr. Herbert Spencer's philosophic system may be disputed on many points, but his elaborate analysis of the phenomena of social life and his exposition of the minute analogies they exhibit to the processes of evolution in nature must always remain a landmark indicating the conquest of a great territory of human thought.[2] Here, as in nature, we find a principle of movement and progress conflicting with a principle of inertia. We find all grades of development existing at the same time. We see the gradual progression, by means

[1] J. H. Newman. [2] See PRINCIPLES OF SOCIOLOGY, Part II.

of all kinds of by-ways, to a goal which one might have expected intelligence to attain simply and directly. We see parallels in human societies to arteries, nerves, to co-ordinating and ruling brain-centres, to the specialization of different members or organs for different tasks; and we see all these things growing up slowly, from point to point, in obedience to immediate and pressing requirements. We find, both in nature and in society, survivals of past structures, whose use is gone, carried forward into new stages of development. A particularly interesting analogy is that of structures which develop to meet one kind of requirement, and, on the cessation of that, persist into a further stage and are then modified to meet quite other requirements. Thus the swim-bladder of the fish became, it is supposed, the lung of the terrestrial animal. We may compare this with the development of municipal institutions. Originally intended to enable bodies of craftsmen and merchants to make head against the aggressions of a feudal aristocracy they have survived the fall of feudalism, and have become more important than ever as independent agencies for carrying on the functions of social administration and education.

Thus, operations in the physical world which certainly do not look as if they were the work of intelligence, as we understand it, are seen to be closely paralleled by transactions in the history of man's social life. The development of life, in fact, is

carried forward when the plane of human consciousness is reached on just the same lines as those which prevailed on the vegetable and the animal plane: there is no breach of continuity in the broad outlines of evolutionary progress. It is difficult to over-estimate the significance of this fact.

Perhaps nothing that man has evolved is so purely a work of mind as Language. Here, the analogy with the phenomena of physical evolution is very close and very illuminating. As in nature, the ultimate origins are obscure—we can only form hypotheses as to how language came to arise from the cries of animals, as we can only form hypotheses how life arose from the play of molecular forces. But when both are once established on the earth we see in them the same general features—unity, in a few leading types, branching out into infinite modifications in subordinate groups. Greek, Erse, German, Russian, Sanskrit are all Aryan tongues and have all a common ancestry. They differ widely among each other, but all alike are marked off from the Semitic or the Mongolian families. So a man, a snake, a bear, a fish are all vertebrates, and belong to a type essentially distinct from that of a lobster or a snail. As in nature, we find all stages of development existing at the same time—some lines of development show a rapid advance, some a very slow one. Some types have, in both cases, perished completely—there are fossil languages as there are fossil species. A new

invention, an advance *per saltum*, without the utilization of existing constituents, is almost as rare in the evolution of language as in that of species. Just as the lung is developed from the swim-bladder, so the human mind, in the development of language, takes hold of whatever existing form will suit its purpose and transforms it to another end, as when it takes a word for 'breath' and makes it 'spirit.' There are laws governing the development of root-forms, linguistic or physical, in various different orders or species. The same osseous framework yields us in one class of animal a hand, in another a hoof, in another a paw, in another (as in bats) a wing. So in language the same root yields us the words, in different languages, for *shining*, *showing*, *speaking*, *proving*, *a face*, *a story*, *whiteness*. Another gives us, *young*, a *stepmother*, a certain *musical string*, a *messenger*.[1] Contrariwise we see both in nature and in language forms which have grown from entirely different roots into a close external and functional similarity. What unlearned observer would suspect that a whale was not a fish, and that it descends from a furry land animal with four legs, or that the Latin *Deus* and the Greek *Theos* with their perfect identity of meaning and their almost perfect identity of sound have probably a widely divergent etymological pedigree?[2]

[1] See Curtius, GRIECHISCHE ETYMOLOGIE, s.v., *φημή*, *νέος*.

[2] *Deus* descends from a root meaning 'to shine,' hence the Day, the Sun, God ; *θεός* is referred by Curtius to a root *θες*, to desire, pray —God is "der Angeflehte."

On the other hand, the etymological identity of such words as *évêque* and *bishop* is as obscure on the surface as would probably be the relationship of a greyhound with a bull-dog to an anatomist who saw them only in fossil form.

Again we note that languages, like species, when they send out a migratory colony, are capable of gradual transformation to meet new conditions, and of marked divergence from the parent stock. Thus English, as spoken and written in the United States, in spite of the retaining influence of a common literary tradition, is steadily diverging from the English of Great Britain.[1] So with the French of Canada, the Spanish of South America, and the Dutch of the Cape. We note also in both cases that curious phenomenon, the survival of the useless relics of earlier structure, e.g. in the silent letters which reveal the historic origin of innumerable English words, which are paralleled in nature by the vermiform appendix of man, or the splint bones in a horse, or the rudimentary legs of the whale or the python.

But analogies of detail like these, interesting as they are, are not the main thing. The main thing is the *organic likeness* prevailing between the work of nature and this work of man—the likeness of growing and developing structures, with their response to im-

[1] Are there many Englishmen who would understand the following sentence which I lately came across in a St. Louis paper? "This graft was one of the scrap-head variety, and it was hard therefore to get the boodlers good."

mediate needs, their development by specialization of function, their lack of a strict logical scheme, their anomalies and capricious variations, and their control of these variations within certain archetypal forms. The substance of language is sound, as the substance of life is protoplasm. Phonetic laws govern the one as mechanical and chemical laws do the other. But phonetic laws and the capability of producing sound could never have made a language. The evolution of language is urged forward by the constant pressure and expansion of human thought; and on human thought, in its turn, it reacts, giving the stimulus and the starting ground for fresh expansion. We have the heart of the analogy before us now. *As thought acts on language so the pressure and expansion of the life-impulse acts on the forms of matter.* Let us see whither the comparison leads us. Language is a product of the human mind, but not of *a* mind. When a human mind consciously applies itself to the fashioning of a language it produces Esperanto. If we were living in an Esperanto universe, such as Paley makes out this to be, we might draw Paley's easy conclusions as to its Maker; but the reality is very unlike that. On the other hand, if mind has produced the natural languages which we see, with all their anomalies, imperfections, and slow organic growth, then the corresponding phenomena in nature, as the evolution doctrine has brought them out, are evidently no bar to the belief that mind has had a part in this

work also. I should go farther and say that the facts compel a belief in the existence in nature of something that can only be described in terms of mind. In other words, the universe is, at bottom, rational.

It is true that the cosmic Reason acts not as a single personal being, but more or less independently at a multitude of points. But it must not be forgotten that it is observed, up to a certain point, to act through groups as well as through units. Even the life and structure of a single cell show us distinct parts acting in harmonious subordination to the interests of the whole. An organism composed of many of these cells exhibits a series of syntheses or groupings rising in comprehensiveness and complexity till the individual is complete and the wheel of development has come full circle, beginning with a single unit and ending with a complex unit. But the synthetic movement of cosmic control does not end there,[1] for aggregates of individuals can be collectively animated by it. The numerous cases of co-operation among animals of the same species are an instance of this. All animals which live in communities exhibit this co-operation habitually, and many others do so occasionally. When Professor Eimer, as we have seen, reflected on the phenomena of reproduction and heredity in ants and bees, he was driven, like Oken, to account for them by regarding

[1] The 'wheel' is really a spiral—the line of all natural growth.

these creatures as "discontinuous organs" of one being, having the same power of affecting each other as have the distinct, though connected, parts of any single animal or plant.[1] As an illustrative analogy, helping us to understand the invisible bond of the communal life of a species, this conception is of service, but I hardly think that we are in a position at present to affirm it in any exact and literal sense. Can we, however, trace the analogy, as Oken did, beyond species, and show anything of the nature of an adaptation of one order of beings to the use of another? To do so convincingly, it is evident that the adaptation must be of *no* use to the creature possessing it; for, if it were, we might expect to see it evolved, whether it were incidentally of use to a neighbour species or not. Honey, for instance, though apparently of no *direct* use to flowers, is secreted by them because it attracts insects, and insects fertilize the flowers. If flowers secreted honey solely for insects' use, deriving no benefit from their visits, we should have a case of a synthesis of communal life wider than that of the species. Are there such cases, or does every species fight exclusively for its own hand?

"If," wrote Darwin, "it could be proved that any part of the structure of any one species had been formed for the exclusive good of another species, it would annihilate my theory, for such could not have been produced through natural selection."[2]

[1] See p. 111. [2] ORIGIN OF SPECIES, chapter VI.

Certainly it could not, but neither could other adaptations. Natural selection, as Darwin knew well enough, does not "produce" anything—all it can do is to depress the less favourable variations presented to it in favour of the more favourable ones. As Darwin never professed to have sounded the depths of the problem of variation, it is not clear why variations favourable to another species than the one in which they occur should be presumed to be impossible. It is true that they would not illustrate or come under the operation of natural selection, but neither would they contradict it—they would simply be outside it. Individuals unquestionably exhibit modifications intended not for their own personal benefit, but for that of the species—for instance, the maternal instincts. The modification of a part in the interest of the whole to which it belongs may, perhaps, turn out to have the same essential significance whether the part is an organ or instinct belonging to the synthesis called an individual, or an individual belonging to the synthesis called a species, or a species belonging to some fauna or flora of the globe. In any case, the question where synthesis is arrested, and where the fight for one's own hand begins, is one of great interest and must be here briefly discussed. Cases such as those of which Darwin rejected the possibility certainly appear to be rare, if they exist at all. The naturalists of the older school, of course, saw them everywhere—the rattle-

snake's rattle was to warn its victims, the colouring of flowers was to give pleasure to man, and so forth. Most of these cases have been exploded by modern research. The modern naturalists, however, may not be right in refusing to see them anywhere. The question demands much special study and observation. Reverting to the case of flowers and their secretion of honey, one is struck by the fact that in the *Viola* family there exist flowers more or less conspicuous, and endowed with scent and with honey-filled nectaries, which usually do not play any part at all in fertilization. The process of fertilization in *Viola* is carried on by small flowers hidden under the leaves which never open, and which fertilize themselves. Again, at the base of the laurel leaf, on each side of the midrib, there are two small glands filled with honey, and bees may be observed biting into these in the early part of the year before flower-honey is plentiful. Nägeli has an ingenious argument to show the existence, not exactly of disinterested aid among species, but of something which would make such aid look more possible than it does, of a mutual responsiveness, namely, between the form of the honey-receptacles of certain flowers and the probosces of the insects which frequent them. Taking a short honey-tube as the normal and original condition among plants, and a short proboscis among insects, he argues that the honey-tube could not have lengthened

without depriving the species in which it did so of the chances of insect-fertilization unless the insect-proboscis in certain species lengthened *simultaneously*.[1] Cases also have been noticed of sea-anemones, which attach themselves to the shells of hermit crabs and by their poisonous tentacles repel attacks on the crab.[2] The crab is no doubt useful to its guest by providing it with the means of locomotion. Still, the case of mutual help between two such different orders of beings is remarkable. A very peculiar case is that of the waterfern, *Azolla*, which has certain roomy cavities on the underside of its leaves. These are always found to be occupied by a small unicellular organism of the *Alga* order (*Anabæna*). It is of no apparent use to the *Azolla*, which provides it a home. The arrangement must have been of immensely long standing, for it occurs in all the four species of *Azolla*, one of which is found in America, two distributed over Australia, Asia, and Africa, and one only in the Nile. It must, therefore, have arisen before the original species split into four.[3]

It would be rash to conclude from these and some similar curiosities that we are really in the presence of the phenomenon of disinterested aid given by one species to another. The question needs more inves-

[1] MECHANISCH-PHYSIOLOGISCHE THEORIE DER ABSTAMMUNGSLEHRE, p. 150.

[2] Weismann, THE EVOLUTION THEORY, I, p. 162.

[3] *Ibid.*, I, p. 177.

tigation. But an important general consideration arises in this connexion. It is clear that there could be no advance in evolution if nature consisted solely of a multitude of independent units of life, fiercely competing against or warring with each other. It is equally clear that no advance could take place if every organism found an environment so perfectly adapted to it as to call for the very minimum of effort and strain in the maintenance of life. Between the chaos of the first supposition and the lubberland of the second there must be a condition of nature in which synthetic organization is carried just to the point at which life will have the maximum power to perfect and to realize itself. Looking at the conditions of nature as we know them, and at the majestic expression of material and spiritual life which those conditions have permitted, we may well be content to believe that both the synthetic process, as far as it goes, and its *apparent* suspension at a certain point in the ascending scale, are the outcome of one and the same motive and have one and the same significance—they both alike mean and make for the conservation, the development, the enrichment of life.

Against this view there is an argument which has hitherto only been glanced at, but which must now be discussed in more detail. It is represented in a recent work by Prof. Conrad Günther, one of the latest champions of the theory of chance variations

and natural selection as the sole explanation of evolution, who has assembled a number of instances to show that the "purposive force" which biologists are now coming to believe in "often fails in living beings." Such are, for example, the fact that an *Amœba* seeking nourishment will take in a particle of stone or anything that comes in its way;[1] that the mutual relations of flowers and insects are often unsuitable; that a bee will sting a human being just as it will another insect, although the sting, only meant for the latter kind of use, cannot be withdrawn from the human skin; that embryos often go astray during development; that a cricket which tries to escape in the open by burying itself in the earth will act similarly if you set it on a glass plate; and so forth. Nature, of course, teems with such cases—one might add the singular degeneration of the slave-making ants already described in some detail.[2] "If," he concludes, "the purposive reaction in the vital force of animals were independent of the external world, they would be armed against all contingencies, and that is not the case."[3]

Thus, too, Prof. Eimer, who in dealing with cases where the alleged *X* factor in Nature has gone wrong, writes:—

[1] So the cogwheels of a machine designed for some useful purpose will lacerate the hand of a man who gets in their way.

[2] See p. 85.

[3] Darwinism and the Problems of Life, 1904. Eng. transl. by J. McCabe, 1905, pp. 354 *sqq.*

"The zoologist can hardly accept the existence of such a dominant inner factor ever pushing toward advance, when he recalls the host of regressive structures which he has to see."[1]

Now when the cause of physico-chemical *versus* vital agencies comes to be tried, not in the laboratory but in the study, not by science but by philosophy, the first question that will be asked is, What, then, is your distinction between 'vital' and 'physico-chemical' energies? How are we to recognize when we are in presence of the one or of the other? The usual answer to this searching question is that in vital agency we find a directive, a purposeful, a psychic element, whereas physico-chemical energies seem to be nothing but the play of a blind, indifferent mechanism. But, it will be rejoined, how can any one affirm that physico-chemical energies are not also vital, directive, psychic? Is there not, in fact, something psychic in the very conception of energy? To these questions there seems to me no conceivable reply. When a 'vital' energy has been reduced to a 'physico-chemical,' we have evidently explained nothing—we have only exchanged one mystery for another.

Yet if there is no difference in essential nature between one kind of energy and another, there does

[1] ORTHOGENESIS DER SCHMETTERLINGE (1897). The passage will be found in Kellogg's DARWINISM TO-DAY, p. 285. Instances of 'regression,' etc., are given by Kellogg, *op. cit.*, p. 227.

appear a marked difference when we come to consider them in relation to particular results of their operation. Let us take an example. We explain that classic instance of gravitation, the fall of an apple, by reference to the law formulated by Newton which extends to every particle of matter in the visible universe. But we also find that the fall of the apple is, for apples, a necessity of life; if the seed did not fall to the ground when ripe there would be no more apple trees. Yet gravitation acts quite indifferently to the life of the apple. Whether the branches overhang a river, or a street, or a plot of fertile ground, the apple will fall straight towards the centre of the earth. The fulfilment, therefore, of the vital needs of the apple is plainly a by-product of the force of gravitation. In this relation, gravity has no directive or psychic element. Yet in larger relations, we have to take note of the fact that if there were no such thing as gravity, there would be no apples and no earth. Thus the law of gravitation is a condition of life as we now know it. The fact that it acts mechanically, without selection or purpose, in relation to particular occurrences is quite consistent with the view that it, or the conditions of the ether from which it possibly arises, may be directive and psychic in relation to life as a whole, or rather to what we recognize as the manifestation of life in the material universe.

We have now got hold of a valid distinction between mechanical and directive agencies. We can distinguish them not by their nature but in relation to the particular phenomenon we are considering. We call them mechanical where that phenomenon is a by-product of the agency, and directive where, if the agency were conscious, we should say that this was its main intent. I can see no more fundamental distinction. It follows from this that the same action can be at once both mechanical (physico-chemical) and directive. The old distinction between vital and mechanical energy disappears. The question resolves itself simply into that of the number of distinct agencies which are deemed necessary to account for the universe.

Now the true way of dealing with this problem of the unity or multiplicity of agencies in nature is, I would suggest, to assume the existence of a single power which is of course psychic and directive but which can only be communicated to matter by degrees and under certain conditions still very obscure. These conditions it itself both creates and uses. Its development in Time and that of matter go on, as it were, on parallel paths, eternally apart (to our limited view) yet eternally inseparable. The key to the course of its development in nature lies in the word Synthesis.[1] Here we seem to have the

[1] When Heracleitus wrote "The One arises from the All and the All from the One" (Frag. LIX. Bywater) he was stating with his usual pregnant brevity a position of deep significance for modern scientific thought.

explanation of the apparent difference between the so-called 'vital' and the physico-chemical forces. When matter has been so grouped as to form not a mere aggregate of particles but a synthesis, then that synthesis is enabled to make use of energy in a manner not open to its parts. Synthesis is a condition of the discovery or liberation of unsuspected forces. Thus a synthesis of molecules produces the stage for Life, a synthesis of living particles produces the Cell, a synthesis of cells produces an organism, a synthesis of organisms is a species—for the evidence (most notably that derived from the consideration of bee and ant communities) seems to show that material discontinuity in the members does not preclude the existence of a true synthetic union.[1] The characteristic power gained by a species is that of evolutionary development working in the obscure region of germinal combination and variation. Of course, I am aware that all this is merely a way of representing facts so as to make them intelligible to and manageable by the mind. If any one should object that we do not know what kind of grouping a synthesis is, except precisely through that very organic activity which I have described as its product or accompaniment, I entirely agree. All these terms are intellectual forms—like atoms, molecules, and

[1] It must be borne in mind that strict physical continuity does not exist in nature. Sir Oliver Lodge has somewhere remarked that science is entirely at a loss to explain how it comes that when one picks up a stick by one end the rest of the stick comes up with it.

other concepts of physics. They do not reveal anything; they merely help us to comprehend. In the region of the controversy of Vitalism *versus* Mechanism, the conceptions which I have been trying to explain enable us, without introducing a multiplicity of different energies, to understand how an organism synthetized by life may exhibit directive action which looks entirely different from any action possible in dead matter. Yet it works under laws of its own, and no doubt the particles of such an organism, if they were conscious, would be unaware that any but physico-chemical processes were in operation; in fact, I should have no hesitation in agreeing with the statement with which the great physiologist, Verworn, concludes an exhaustive analysis of this obscure subject: "The general fact must be regarded as established, that all the work of the organism is based finally upon chemical energy."[1] But what directs the chemical energy? Something which is not itself a chemical energy and which is associated with the organic synthesis which that energy serves to maintain. Verworn's statement, it must be borne in mind, is as true of the composition of the Iliad as it is of the digestive process of an animalcule.

The explanations above suggested are purely tentative; but so, it must be remembered, are the theories which they combat. No one pretends

[1] General Physiology, p. 550.

that the mechanical explanation of the universe, including the phenomena of organic life, is at present made out so as to cover the known facts, or even that expert opinion is at all unanimous in the belief that it can ever do so.

I know no single work in which the present position of the controversy is so well set forth as in Professor V. L. Kellogg's DARWINISM TO-DAY.[1] A great array of scientific authorities will there be found mustered, and the verdict of Professor Kellogg (reluctantly given, for he clings to the mechanical explanation of the universe) is that evolution is not explained by any mechanical force at present known to science. "With Osborn," he concludes, "let us join the believers in the unknown factors in evolution."[2] He does not, however, contemplate their remaining unknown—we have to say *Ignoramus*, not *Ignorabimus*; and by 'known' he means apparently, reducible to a mechanical process. He will have nothing to say to any internal force directing the energies of matter, such as the *Vervollkomnungsbewegung* of Nägeli.[3]

[1] Published by Bell & Son, 1907.

[2] DARWINISM TO-DAY, p. 377, quoting H. F. Osborn's THE UNKNOWN FACTORS OF EVOLUTION. Osborn, like the writer (see p. 90), holds Spencer and Weismann to be mutually destructive. "If acquired variations are transmitted there must be therefore some unknown principle in heredity; if they are not transmitted there must be some unknown factor in evolution."

[3] MECHANISCH-PHYSIOLOGISCHE THEORIE DER ABSTAMMUNGSLEHRE. See especially pp. 132, and 340 *sqq*.

"Such an assumption," he writes, "of a mystic, essentially teleologic force, wholly independent of and dominating all the physico-chemical forces and influences that we do know, and the reactions and behaviour of living matter to their influences which we are beginning to recognize and understand with some clearness and fulness—such a surrender of all our hardly won actual scientific knowledge in favour of an unknown, unproved, mystic, vital force we are not prepared to make."[1]

The above passage is very well fitted to be the pivot of the whole controversy. We shall examine it therefore in some detail.

It is, in the first place, hardly correct to say that the *X* factor in life and evolution is supposed by thinkers like Driesch, Reinke, and Nägeli to be 'wholly independent of' and to 'dominate' all the physico-chemical forces that we do scientifically know. Man, for example, cannot be said to be 'wholly independent' of the physico-chemical energies of which he makes use for a multitude of objects. He is very dependent, both on those outside him and those in his own organism. He cannot *originate* the smallest quantum of physical energy. Yet he is unquestionably capable of directive action upon matter.

In the second place it must be pointed out that the *X* factor, conceived as it is in this book, though Prof. Kellogg may call it 'mystic' if he likes, is

[1] Darwinism To-day, p. 278.

certainly anything but 'unknown.' There is nothing more mystic than the human spirit—does not mysticism mean the attribution of spiritual significance to material things?—but there is nothing more real and certain. The very act of knowing, however material or mechanical may be the object of knowledge, is an act of the spirit, and we know the spirit itself better than anything else. How did this spirit come into active being? There are only two conceivable ways. Either it was at a certain moment projected into the universe from without by a Supreme Spirit, or it was, like everything else, evolved. If we accept the former view we may say good-bye to science. Miraculous interventions will explain anything, and if we admit them in one case they may be valid everywhere. But if we take the second view, as do practically all men of science, we are bound to admit that spirit had from the beginning some constant and natural relation to matter, for evolution does not work miracles—it cannot make something out of nothing. If, then, we regard Man not as an outside observer of the universe but as an organic part of it—and I believe no thinking about nature can be of any value until we have grasped and fully realized that position—then there can be nothing to surprise us if we find traces of a directive control in the elementary processes of life and development. It would be more surprising if we did not. If we reduce the whole

universe, apart from the human spirit, to physico-chemical processes we are at once confronted with the problem of evolving the human spirit out of such processes; and that, on the face of it, is a sheer impossibility. All physical and all chemical phenomena as such are reducible to the movements and groupings of atoms and molecules. These movements and groupings can affect the spirit which finds itself mysteriously implicated in their activity, and the spirit can affect them. But that molecular movements can *create* spirit is unthinkable by any one who realizes what spirit is and what movement. Rather should we say that in the power of movement, in action, change of any kind, we are to see the evidences of spirit.

We are now in a position to discuss the difficulty raised by Eimer and by Günther, when they point to instances where the supposed psychic force in nature has failed to achieve its end. It fails because, on its mechanical side, it sometimes encounters obstacles which on the psychic side were not provided for. The law of gravitation is a condition of life, but it will kill a man who falls over a precipice. The adaptability of protoplasm is a necessary condition of evolution, but circumstances will occur in which the adaptation means degeneracy for the organism as a whole. Eimer's argument is good, indeed, against the mythological conception of a supreme Creator, perfect in prescience and in power, who orders the

goings-on of the universe from his throne above and outside it. But we seek for no such being in natural phenomena. Perfection is no attribute of anything that operates in Time, and so far as we regard the divine life as working in Time we must regard it as becoming, not as being, perfect. Again, Eimer's objection shows that he conceives the psychic force against which he is arguing as in itself something mechanical, a mechanized kind of vitality, which ought to achieve its end with a flawless exactitude. Of this, also, nature knows nothing. The universe is what it is precisely because the Power behind its phenomena is neither blind Chance on the one hand nor rigid determination on the other—because it is vital, progressive, and free. This power is certainly capable of making imperfect adaptations and of diverging into false side-tracks of development. That is a fact of much significance, but it is no argument against the existence of such a power—it merely reveals its character. A special study of regressive structures and of the laws and principles which lead to them would have extreme interest, both for biology and for philosophy. But it could not affect the significance of the broad fact that, in a world where the highest living being was once a particle of shapeless protoplasm, we have now Man, a being lamentably unfit, indeed, to be the last birth of Time, but uniquely great by his very consciousness of that unfitness.

In contemplating this wonderful ascending movement let us not forget that the warrant for its continuance rests in ourselves. The false tracks, the regressive forms, which meet us in nature prove at least this: that the line of development which we observe on earth may conceivably end in a disaster which would bear to the course of Life in general just such a relation as the degeneration of the Amazon ants does to life on this globe. We are by no means entitled to sit still and expect that the current of evolution will bear mankind along irresistibly to its goal. With the development of the conscious will *we* are made responsible for the advance of life in the only sphere which we know and which our actions can affect. Man is, as it were, the growing-point of that progressive life. If his strange passion for the perfection which he has never seen should be smothered in the struggle for mere existence, or corrupted by brutal luxury, then growth will be at an end, atrophy or degeneration will set in. The vision of a nobler, freer, more humane life than is anywhere widely possible on earth at present cannot be realized without the strenuous help of men and women who have learned to subdue the Ego with its fierce egotisms into harmony with the purposes of the divine Whole. But this much we may say—that they will not fight alone. No one ever pursued a high and worthy aim without finding that he had drawn to himself those 'great allies' of whom

Wordsworth has written so greatly; powers implicit in the nature of the world, and always waiting to be unlocked by the heroic Will.

The Power, some of whose workings it has been attempted to trace in the foregoing pages, is a controlling and directive force, making, through countless varieties of being, for one clear and definable end—the realization of life. It may be asked, Are we to regard this divine Power as wholly immanent in matter or as partly transcending it and governing it from without?

The nature of the divine principle, so far as we are able to discern it, cannot be fully discussed until we come to consider it in the highest sphere of manifestation yet known to us, that of the human soul. But with the question which has just been raised we are now in some measure able to deal, and the consideration of it may bring this section of our study to a close.

In the world of inorganic matter, the tendency of units to form themselves into groups having relation to other groups is already visible. A force immanent in the atom clearly becomes transcendent *in relation to the atom* when atoms group themselves into molecules. And when molecular affinities come into play, and obey definite laws of form, as in the wonderful phenomena of crystallization, we see that the force immanent in each molecule becomes trans-

cendent, as regards the molecules taken separately, when we look at them from the point of view of the completed group. Crystallization is a process which trembles on the very verge of vital action. And in vital action the alternation of immanence and transcendence in an ever-ascending scale becomes still clearer and more significant. Every cell is a collection of forces controlled by a power which transcends each one of them, or any number of them below the whole. Every cell colony, like the *Alga* described in an earlier chapter,[1] has a life which is immanent in the colony but transcendent as regards its component members. Definite groups of cells make up the structure of the highly organized plant or animal, and exhibit the same combination of forces immanent in the parts and transcendent, as regards those parts, in the whole. Again, each whole, each individual, is moved by life-impulses immanent in itself but transcendent in so far as they represent the communal life of the species to which it belongs. This communal life of the species becomes immanent again when we regard it as embraced in the life of the totality of beings on the globe. The thought must at once occur, as the ascending series passes out of reach of man's intelligence: Whither, then, does it lead us in the end? Is there any end? And is our knowledge of Being absolutely limited to those parts of it which lie *beneath* us?

[1] p. 49.

We are, I think, able, without going beyond the limits of observation and experience, to frame a synthesis of all physical nature, and to express its character in terms of Life and Response. But at the next step we have to embrace man with his moral nature, his intelligence, his personal consciousness, and there may for aught we know be beings far higher than man who must also be included. Now here we are not only *in* the synthesis and therefore unable to grasp and survey it, but we are also quite unaware of its contents and limits. We ask, Is the All of Things personal? is It conscious? has It a manlike intelligence? and so forth, and I confess I see no way of answering these questions with our present capacities. We can only say—but this is much—that as the universe is one, the part of it which we do not see cannot stand in any essential contradiction to that which we do.

Furthermore we must remember that since, in that aspect of us which observes and studies, we are distinct personalities, we are obliged, in so observing and studying, to regard things as outside of ourselves. This is the core of the whole difficulty. At bottom, the relativity of human knowledge does not depend on the fact that time, space, and causality are, as Kant has taught us, modes of thought imposed upon our 'I,' with nothing external answering to them; it goes deeper, it depends on the ultimate fact that I *am* an 'I,' and *therefore* separate (as such)

from what I observe, and *therefore* only capable of studying my own states as affected by external things, not the very things themselves. Real knowledge, then, must consist in getting out of this prison of 'I'-hood and entering into actual union with what we observe. Could we do that, we should at once live not in our 'selves' but in the Whole. The question then is, whether it is ever possible so to escape, and how?

We must note, however, that no one who has done this could ever tell us precisely what he has done. For the moment he begins to put his experiences into an intellectual form, the laws of the mind reassert themselves, things externalize themselves again, the 'I' reappears, the gulf yawns again between subject and object.

And yet the instinctive language of man shows that he does regard it as possible to *lose himself* in the contemplation of something transcending his powers of ordinary intellectual apprehension. Why should he not? If a transcendent Reality exists, as it must, then the faculty of entering into conscious relation with it is one which Time would surely some day bring to birth.

And although no man, as I have said, can ever express to other minds in terms of the intellect the reality he has thus witnessed, he has found means to do better than this—he can help them to share his vision. These means we call Poetry, Art, and

Religion which is the poetry of Ethics. Through these it is that man most truly lives, because united in spirit with a larger life than his 'self' and his senses are aware of. Through them it is that while the eye sees the sunrise, the spirit sees the glory, that while the intellect apprehends Truth, the soul is ready to die for it, that while self-interest bands men together in communities for mutual service, Love prompts to the services that will never be recompensed. We are not then, it seems, absolutely imprisoned in our 'I,' strait as the bonds may seem. But this must be added, that they will never seem so strait as when we fancy that we can get out of them by any purely intellectual conception of the Ultimate Reality. "God," says Æschylus most nobly, "is the Air, God is the Earth, God is the Heavens; yea, God is all things, and That which is above them."[1] There is always a 'beyond' for the explorations of the intellect. The function of the intellect is to combine and reduce to order the experiences of sense, thus guiding us with definite aim through the bewildering wonders of life. But let us not dream that it can ever guide us to any goal or terminus. The goal is at once infinitely distant and nearer than our breath and blood. The search for it will last as long as Time. It is of the essence of the view of the

[1] *Ζεύς ἐστιν αἰθὴρ, Ζεὺς δὲ γῆ, Ζεὺς δ' οὐρανὸς,*
Ζεύς τοι τὰ πάντα, χὤτι τῶνδ' ὑπέρτερον.

FRAG., 295.

universe here put forward that the intellect can never embrace it in any closed system of thought. Turn as we may to one after another of these closed systems as each grows out of harmony with advancing knowledge and insight, the true conclusion, at least for readers who have followed these pages with assent, will be to stand cheerfully ready to renounce all systems, trusting in the last resort to no formulas, but to the play of eternal Powers on the imagination, the heart, the will:—

> "They bring none to his or her terminus or to be content and full,
> Whom they take they take into space to beho the birth of stars, to learn one of the meanings,
> To launch off with absolute faith, to sweep through the ceaseless rings and never be quiet again."[1]

[1] Walt Whitman, 'The Answerer.'

PART II: ETHICS

CHAPTER VII

LAW, FREE WILL, PERSONALITY

> "——And this main miracle that thou art thou,
> With power on thine own act and on the world."
>
> TENNYSON.

THERE is, according to Mr. Herbert Spencer, a question lying at the root of all ethics, a question which must be "definitely raised and answered before entering on any ethical discussion."[1] This is "the question of late much agitated, Is life worth living?"[2] I confess that this question does not seem to me at all a radical or pressing one in comparison with another of which Mr. Spencer, in his DATA OF ETHICS, takes no account whatever—the question whether we have any real choice in the way we ought to live so as to make life of value, or in other words whether there is an 'ought' in the business at all. Can any man regulate his own living? Is he not, even while he lives and thinks,

> Rolled round in Earth's diurnal course
> With rocks and stones and trees,

as much a helpless victim of external forces as they

[1] DATA OF ETHICS, 29. [2] See Appendix C.

are? Does the realm of natural *law* extend to human actions and volitions; and if so, must it not be an illusion to suppose that these can possess any ethical quality whatever?

A great deal of the perplexity attaching to the old problem, how to reconcile human free will with divine predestination and omniscience, has, it seems to me, been carried forward quite needlessly into the new problem of the reconciliation of free will with the reign of natural law. The problem in the old form which occupied Milton's rebel angels has scarcely any meaning for modern thought. Human actions are a part of the world of phenomena, existing in time and space. When we think in that sphere of things we conceive the Deity as the synthesis of all things, and as the intellect can never arrive at this synthesis, it follows that we can never represent the Deity in terms of the intellect. An infinitely wise, infinitely good and powerful Being *has no definable relation to the phenomenal world at all.* Therefore there can be no question either of reconcilement or of opposition between the attributes of each. God has not planned beforehand the course of the world because (speaking in this sphere) God *is* the world—past, present, and to come; and His being is in process of completion by the world's development. In another sphere, behind the veils of space and time, of causality and of sense, resides the Eternal Beauty, the Eternal Wisdom, the Eternal Love,

approachable indeed by those who come to it "as a little child," but evading the questionings of the intellect.

But the modern problem of Determinism and Free Will has meaning enough for us all, without bringing any transcendental relation into the question. Let us state briefly the position of the Determinists. It is held by them that every human thought—in fact, every mental change whether of the nature of volition, thought, or emotion—is a necessary effect of certain antecedent causes, just like every change in the material world. Every act of will is, on this view, the mechanically accurate resultant of two forces: (*a*) the particular nature of the man who wills; (*b*) the circumstances which supplied the occasion for the volition. It would seem to follow from this that no man can be held morally accountable for his actions. Were we sufficiently acquainted with his nature and with the course of external circumstances, we could predict his action throughout his whole lifetime as surely as we can foretell an eclipse. He is what he has been made by the circumstances of his life acting on the whole mental and temperamental make-up which he inherited from his parents. He does good or ill as a tree bears good fruit or bad according to its nature and to the treatment it has received.

The old theory of Free Will, which was content to declare that each man's choice in any ethical situation presented to him by life was not imposed on him by

the will of a Deity but was *his own* choice, thus making him responsible to God and man for his acts, evidently requires to be restated in view of the conception of scientific Determinism just described, which does not seek to impose on man the will of any other personal being. But when we come to restate it, the distinction between Free Will and Determinism appears to be by no means so clear and intelligible as it seemed at first sight. The essence of the Determinist theory is simply that the same man will always, under the same set of external circumstances, act in exactly the same way. But how far does the advocate of Free Will really deny this? Imagine a man whom we regard as a type of honour and integrity, a General Gordon, for instance, in the position of being offered a bribe to betray a trust reposed in him. We are quite assured that he would reject it, and that he would reject it again and again to the end of the chapter. So long as his mind and character remained unchanged, his action would never vary. Was his will therefore not free? And if so, how do we distinguish its freedom from scientific Determinism?

We shall find that while the statement of the Determinist position is quite easy and simple, the statement of Free Will, the explanation of what we really mean when we talk of the will being 'free,' is, when we look closely into it, a matter of much intricacy. Believers in Free Will, says J. S. Mill in his essay 'On Social Freedom,' are those who "believe,

in fact, that they themselves can, within certain limits, do what they please."[1] This is, indeed, the answer which comes at once to the lips of the average man when Socratically interrogated as to what he means by Free Will. But the nature of the limits is just the critical part of the question. I cannot fly because I please. I cannot write a line of poetry because I please. Can I live a saintly life because I please? Perhaps not, it may be replied; but after all Free Will does not essentially mean the external fact of doing, it means the internal act of choosing—let us substitute the word 'choose' for the word 'do' and see what we arrive at. Very well, then; I can choose what I please: let us try this formula. But at once we perceive that this is a tautological expression, for what I 'please' to do is simply what I choose. So the formula is finally stripped to this bare expression, 'I can choose.' But now the Determinist will say, 'Who denies it?' The psychological process known as 'choosing' is within every one's experience. The question as to what governs the choice remains untouched. The core of the problem, then, has been found to lie not in the word 'do,' not in the word 'please,' not in the word 'choose.' Where is it then? It is not in 'can,' for 'I can choose' adds nothing philosophically to the contents of 'I choose.'

[1] *Oxford and Cambridge Review*, June, 1907. *Sic* also Bishop Berkeley, ALCIPHRON, Dial. VII, 19, "A man is said to be free, so far forth as he can do what he will." Berkeley's analysis of this statement is substantially the same as that in the text.

The core of the problem is the word 'I.' And until we have settled what 'I' am, we shall not reach a clear issue between Free Will and Determinism.

So the test which we have applied to human actions with a view to finding out whether they conform to law as do physical phenomena or not—the test, namely, whether they always come out the same under the same circumstances or not—breaks down. The 'circumstances' include the man himself, and the question 'What is a man?' turns out to be the real point at issue.

The Determinist usually belongs to a school which has a clear and simple answer to this question. Man, for him, is a complex of vessels, nerves, ganglia, and molecular configurations of brain matter responding to external stimuli as uniformly and inevitably as a plant. Consciousness is merely a sort of by-product of this mechanism, which would go on just the same without it.[1]

But this view is in direct contradiction to the deepest and clearest deliverance of human consciousness, which affirms that I am a deliberative and ruling Mind, and bids me regard my Will as Reason in action. I seem to know this so intimately and pro-

[1] Herbert Spencer, translating these physical terms into their psychic equivalents, declares that the illusion of Free Will "consists in supposing that at each moment the *ego* is something more than the aggregate of feelings and ideas, actual and nascent, which then exists" (PSYCHOLOGY, I, p. 500). The pivot of the doctrine is the word *aggregate.* We have seen that the most primitive living organism is something more than that. *Cf.* p. 119 *note.*

foundly that if it is an illusion there appears to be nothing else in the world of which I can ever venture to feel sure. We know the outside world only at two removes. The external object has first to impress itself in some as yet unexplained manner on our physical organism, and the latter has then in a manner equally mysterious to produce a state of consciousness in the observer. But consciousness, in Man, can turn upon and interrogate itself; it is subject and object in one; and its deliverances, so far as they go, so far as they are pure deliverances of consciousness with no argumentative deduction subtly mingled with them, are the truest things we know or ever can know. I do not see how they can possibly be brought to the test by any other kind of knowledge : *they* are the test of everything.

We find, then, that when we talk of 'free' choice as the prerogative of man what we mean at bottom is the choice of a self-determining Mind. We find, also, that while for every event in the physical world we are obliged to assume an antecedent cause, we are under no such obligation as regards Mind. When we have traced any sequence of causes and effects up to a Mind, we require to go no further. We can conceive a self-determining Mind. If man is such, or so far as he is such, his will is what we call free.

But to say that we are profoundly conscious of the existence of our will does not by any means get rid

of the difficulties connected with this belief, and it is incumbent on us either to attempt a solution of them or frankly to dismiss them as, for the present, insoluble.

If possible, to begin with, we must obtain a clear idea of the difference of the will from other forms of vital action.

At one end of the ascending scale of organic life we see an animalcule swimming in the direction in which it is attracted by food. At the other end, we find a man in the full flush of conscious life going deliberately to a shocking death rather than deny his faith or break a trust. What is the essential difference between the action of the animalcule and that of the martyr? To the Determinist there is none. Both are alike the inevitable response to certain stimuli from the outside world acting on a certain nervous system. But there is one difference in the *circumstances* of the action which will be admitted by all. The animalcule has no *choice*. The martyr has. The animalcule-consciousness has not been developed to the point at which it can take in alternative courses of action and compare them with one another. It is doubtful to me whether any of the lower animals or even of the lower races of man can really do this. At any rate there can clearly be no Will where there is no distinct consciousness of at least two possible courses of action. The Will, therefore, must be re-

garded as coming for the first time into action when a certain stage in the development of consciousness has been reached, the stage at which man is fully conscious of more than one motive. Furthermore, even when the consciousness has been developed to this point we cannot recognize a true act of will unless, *on that particular occasion*, two or more motives were fully present. For instance, a lad brought up in a thieves' kitchen, when he sees an opportunity for stealing a purse, cannot properly be said to have any counter-motive to the theft. And common sense, without having philosophically analyzed the matter, quite recognizes this position of affairs and graduates the moral responsibility of every criminal action roughly in accordance with the facilities which the subject has had for 'knowing better.'

Two or more motives, then, fully present to consciousness, form the conditions under which alone the Will can be said to act. This is in accord with the whole scheme of evolution. The presence of certain conditions gradually evokes the faculty or organ which deals with them. But here an important question arises. When these motives differ from each other morally, can the Will be said ever to choose the evil one? Has it any moral bent? And if not, what is the use of it?

There is no doubt that the ascription to the Will of a certain moral character, and that a very lofty one, is characteristic of nearly all thinkers who accept its

existence at all. "Ill for him," writes Tennyson in lines of Sophoclean dignity,

> "Who, bettering not with time
> Corrupts the strength of heaven-descended Will,"

as though evil came from the corruption and slackness of Will, not from its wrong direction.

In the ethics of Plato it was a cardinal principle that men did evil only through ignorance. Make the soul conscious of goodness, and it could not fail to follow it. Yet it seems that this doctrine, strongly as it appeals to the moral sense of man, would, if held with philosophic rigour, really make the Will unfree. No man can truly choose the good who is unable to choose the evil. The Platonic doctrine may, however, be fully accounted for, and even put in a form in which it can, to a great extent, be justified, if we give weight to the following considerations. Moral action is usually recognized in the renunciation of a strong personal gratification for the sake of some social or other altruistic end. Now in such cases we are always sure that the two motives have been duly present, the moral motive, for otherwise it would not have been followed, and the personal motive, for these are common to all living things, they are at the base of our being, and our own experience tells us only too well how insistent and powerful such motives are. The volitional character of such an act is therefore manifest. But if the lower motive be followed, the significance of the event is more obscure. For we all

understand these lower motives,[1] and they are fairly uniform over the whole of humanity. We can always take for granted that they are present in full force. The martyr undoubtedly hates the idea of being burnt. But we are not so sure of the other class of motives. We cannot in every case feel certain (unless the event has verified it) that *they* were distinctly in view, for man's moral nature is still only at the beginning of its development, we are still far from having evolved anything like a universal moral code, not to speak of the instincts for obeying it. We are inclined to assume, therefore, and I think we are perfectly right in assuming, that when the Will appears in human action it is far more often to good purpose than to evil. In order that it may be free to act on any ethical question, there must be a sufficient degree of ethical development; the character of moral worth must have been impressed upon the spirit. In the strength and stay which it affords to such a spirit, the faculty of Will is most clearly recognized and honoured.

We are now in a position to meet one of the gravest of the objections which have been brought against the doctrine of Free Will. If temperament and circumstance, it is urged, determine human action, there is, of course, no place for the Will—it is a mere illusion. But if Will is present and is su-

[1] Of course they are only relatively lower—there are no essentially 'low' motives in life at all.

preme, how can temperament and circumstance play the part they manifestly do—how does the history of man come to present, as we have seen, an aspect so strikingly similar to that of the orderly evolution of physical organisms under natural law? If you bring in Will at all as an arbiter of human action, do you not thereby drive out everything else?

The answer will be clear to those who accept the foregoing analysis of the elements of choice. The Will is neither a faculty of perception nor a faculty of judgment, but a power of free choice. Free as it is, *it can only act on what is presented to it;* and here, beyond question, it is subject to serious limitations. Every man has round his soul, as it were, a refracting medium, through which the external objects that excite the Will to action must normally pass before they reach the centres of decision and control. And this medium is probably never quite the same in any two individuals. Often it is very widely different. The sight of an unguarded heap of treasure may appear to one man simply in the aspect of a perfectly legitimate opportunity for enriching himself. To another man it may come as a violent temptation to do what he knows in his soul to be wrong. A third, equally needy, equally capable of enjoying all that wealth represents, may never have a thought on the subject except that of protecting the treasure for its true owner. The object is the same, the physical perception of it is the same, but the 'apperception'

in each case is as different as Peter Bell's perception of the "primrose by the river's brim" was from that of Wordsworth. This difference is caused by the modifying influence of temperament, training, all that forms a man's disposition, whether acquired or inherited. It is as though each man moved in an atmosphere, an *aura* of his own which colours all the objects of his thought. Whether *every* invitation to action that can be presented to the Will must necessarily pass through this *aura* is a very obscure question and one on which I do not at present wish to dogmatize. But it is certain that the great majority pass through it.

Thus on every occasion where the Will is exercised, it has to act not only on the facts which are perceived but *as* they are perceived. Now so far as the influence of what is called apperception is concerned we are in the realm of natural law. Each man, to that extent, is unquestionably under the dominion of his environment, that is to say of geographic, historic, social, and other influences which affect whole communities, and which vary but slowly when they vary at all. The Will, in fact, acts within the framework of nature and its laws exactly as does that directive agency to which, in the view of the writer, is to be attributed the phenomenon of progressive evolution from lower forms of life to higher forms, that is, from forms which admit of less life to those which admit of more. The Will

is really this directive agency coming into consciousness in Mind.

In all life, whether human, animal, or material, there is an element of change and an element of constancy. Between these poles it moves and has its being, nor could life, as we know it, exist for a moment if either of these two opposing but complementary principles were withdrawn. We have now seen that with a full belief in the innovating and incalculable quality of the Will, with the infinite vistas which that belief opens up to human hope and effort, there is yet ample room for the opposing and equally necessary element in life, the element of constancy, uniformity, law. Human Will does not come into nature as a catastrophic force—it develops *pari passu* with the development of consciousness; and it will naturally be found in its highest development where the whole nature is most wholesomely attuned to the purposes of the cosmic Will.

We have now to notice certain grave objections which every student of modern science and philosophy will expect to see dealt with by a defender of the principle of Free Will.

It has been objected from the evolutionist standpoint that, as no one attributes Free Will to the lower forms of animal life, it is impossible to conceive it as having arisen in man except by a miracle. At what point, it is asked, did it first appear? And if one

cannot fix the point, the presumption is supposed to be that it has never appeared at all. It will be remembered that some scientific thinkers such as Mr. A. R. Wallace, and one may add Prof. Reinke, have been so much impressed by the mental difference between man and the beasts that they have assumed the gulf to have been bridged by a catastrophic or miraculous act and not by any evolutionary process.

Now I quite admit that one cannot conceive mind being evolved from not-mind. But neither can I conceive life being evolved from not-life, nor, in fact, when one looks into the process minutely, can I believe in anything whatever, physical or spiritual, turning into something else. I conceive the evolutionary process strictly as the 'unfolding' of latent capacities, faculties, organs, by means of psychic agencies acting within the framework of the fixed relations which we call natural law. The fact that one cannot lay one's finger on the exact point in the history of nature where mind and will began to be is not relevant to the question whether they are now present or not. As well might one be challenged to fix the moment when the embryo becomes a man. There are *no* such exact points in nature. If there were, nature would be discontinuous, and the smallest real discontinuity in nature would be enough to shatter the frame of the universe.

From another side it has been urged that the conception of the continuity or oneness of the universe

is fatal to Free Will. The Monist, according to that brilliant champion of chaos, Mr. William James,[1] must believe in a universe fixed like cast-iron in all its parts, for, being all interrelated, not one of them can be different without altering the whole structure of things.

But does not Mr. James here overlook the fact that essential oneness is not incompatible with temporal incompleteness? The universe is one, true—but this one universe comprises not only all that has been and that is, but all that will be. It is to be conceived at present as a growing organism; it will not be a fixed and completed whole till time is at an end. On this basis I see no difficulty in fitting into a Monistic scheme of thought Mr. James's admirable statement of the Free Will position:—

"Our acts, our turning-places, where we seem to ourselves to make ourselves and grow, are the parts of the world to which we are closest, the parts of which our knowledge is most intimate and complete. Why should we not take them at their face-value? Why may they not be the actual turning-places and growing-places *of the world*—why not the workshop of being where we catch *fact* in the making?"[2]

[1] THE WILL TO BELIEVE—'The Dilemma of Determinism,' p. 145 *sqq*.

[2] PRAGMATISM, pp. 287-8. Compare Bishop Berkeley. "To me it seems, that if we begin from Things particular and concrete, and thence proceed to general Notions and Conclusions, there will be no Difficulty in this Matter. But if we begin with Generalities, and lay our Foundation in abstract Ideas, we shall find ourselves entangled and lost in a Labyrinth of our own making." ALCIPHRON, Dial. vii. 20. Berkeley had fully apprehended the Determinist position; see vii. 16.

The next and last objection I propose to deal with cuts closer to the heart of the question and will have to occupy us, I hope not unfruitfully, for some time.

I instanced some time ago the case of martyrdom as one in which every one would recognize the action of the Will, if it can be recognized anywhere. Let me recall that extremest form of martyrdom which John Stuart Mill once declared himself ready to face rather than outrage his moral sense. Speaking in his EXAMINATION OF SIR WILLIAM HAMILTON'S PHILOSOPHY of what passed in his day for the 'orthodox' conception of the Supreme Being he wrote :—

> "Whatever power such a being may have over me, there is one thing which he shall not do : he shall not compel me to worship him. I will call no being good, who is not what I mean when I apply that epithet to my fellow creatures; and if such a being can sentence me to hell for not so calling him, to hell I will go."[1]

Mill, as we see, relied on his personal freedom of Will to stiffen his neck against any homage to a Power whom his moral sense declared unworthy of reverence. But a modern physiologist would tell him —and even if the fact be not fully demonstrated at present, it would, I think, be very rash for any

[1] p. 129, 5th edition, 1878. There is an evident fallacy in Mill's position. The Deity who could make a hell and sentence men to it for not worshipping him could not also have created the conscience which would resist him. The authorship of the moral sense and of hell are not to be combined in our conception of the divine. But Mill, of course, in this flash of rhetoric, was merely taking popular religious conceptions as he found them.

psychologist to deny it—that by a slight change in the molecular configuration of the brain cells the heroic recusant could have been turned into a devout worshipper of any being who was able to exhibit the credentials of superior force. Such a change would certainly not be beyond the powers of a being who had heaven and hell at his disposal; even a skilful surgeon might accomplish it. What, then, is the freedom of the Will worth (it may be asked) if the direction it takes is at the mercy of the physical configuration of our brain-matter? And the 'I' which, we say, wills—if material changes can thus profoundly alter its character, how can we attribute to it any kind of real and independent existence? Must not the complete dispersal of the molecules of the brain at death cause the 'I' to vanish altogether like a blown-out flame? Must it not be at their mercy during the brief illusion of existence?

Our discussion has thus plunged us into the intricate question of the relations of mind and matter, and we must pause to dwell on it for a while.

What is matter? Nobody can tell. It is that which resists when we push against it—a tactile or muscular sensation. It is that of which two portions cannot occupy the same space at the same time—a visual sensation. It is the source of certain sensations; and the most recent physical investigations points to its being composed of innumerable centres of *force*. But force manifesting itself in orderly and

harmonious fashion is Reason. If, then, Reason is at the base of things, Matter ceases to be a bogey.

Still the fact remains that it is not I and it is not You, and the real cogency of the physiological argument against Free Will and the soul (which, as we saw, must stand or fall together) is that something done, perhaps by mere accident, to this Not-me, can, it appears, powerfully influence and change the Me in spite of all the will I can exert to the contrary. The fact that I, the innermost I, can be got at through my brain, means philosophically exactly the same as the old superstition according to which I can be got at by an enemy who sticks a waxen image of me full of pins and dissolves it before a fire. And *normally* (there seem to me good reasons for not going further than that), *normally*, it is *only* through Matter that the Me can be reached and influenced at all, even by the other Me's in the universe. Now Matter, whatever else we may say about it, is certainly under the law of causation.

From the other, the spiritualistic, side of the argument, it has been sought to meet the above considerations by an interesting analogy. Matter (the brain in this case) may, it is urged, be regarded as the instrument by which, under present conditions, Thought manifests itself and acts. You can take a piano and put it out of tune or otherwise damage it, so as to render it incapable of conveying the real mind of the performer, who, nevertheless, remains

quite unaffected. The soul is the invisible performer. You can damage the brain so that the soul *can no longer express itself* under the conditions of our present existence, but it is an entirely unwarrantable inference to say that you have thereby damaged or destroyed the soul itself. The analogy of physical energy will make this clear. You can make an engine work by the oxidization of coal, but this process can only loosely be described as the source of the energy which is manifested by the engine. All that one does by burning the coal is to turn potential energy into active or kinetic energy. When the engine goes to pieces, or the coal burns out, not a particle of energy is lost; it merely goes back into the shape of potential energy again.

I think this reply is substantially a sound and effective one. At the same time it must be allowed that the physiological argument is more subtle than is usually recognized by those who try to meet it as above. You may so damage a piano as to render it incapable of being properly played on—you may get from it the incoherent janglings of insanity, without affecting our belief in the existence of a real musician behind these unintelligible manifestations. But how if it can be shown that certain mechanical alterations will result, not in nonsense but, let us say, in bringing out mere Offenbach when the performer has always hitherto been wont to play Beethoven? A simple injury to the instrument, it may justly be

argued, has no such vital significance as this change in the nature of the thing expressed. Shall we not have to conclude that the man really *is* the instrument, that the mind is a phenomenon accompanying the temporary combination of certain material constituents, lasting only as long as that combination shall endure and varying *pro tanto* with everything that causes it to vary?

Now, for my own part, I must confess that if mind with all its nobler manifestations such as Will, Love, Duty, and so forth, be a mere rainbow hovering above the cataract of material force, it does not seem to me worth while to discuss anything, for we, mere particles that glimmer for a moment, can never affect anything, and must soon be where nothing can any longer affect us. It is happily quite true as Santayana says in his REASON IN SCIENCE,[1] that people who do not think about these matters at all may "know how to live cheerily and virtuously for life's own sake" on the strength of the normal source of vitality which has made for its own ends from the beginning of things without the aid of our consciousness or criticism. But this consciousness, turning inward as well as outward, this questioning and speculative spirit, are themselves forms of vitality, phases in the gradual conquest of Nothingness (*i.e.* undifferentiated Being) by Life. We stunt and maim ourselves if we try to keep them aloof. It

[1] p. 298.

is true that in encouraging them we may often seem to be turning the terrible, two-edged weapon of Analysis against our own higher life. Be it so! We have taken that sword in hand; we have cut down with it a hundred forms of superstition and wrong; and the time to sheath it is not yet. Whatever dangers there may be in it, we must face those dangers; and though it may be left to another generation completely to overcome them, let that generation, at least, say of us that we did not drop our weapons on the field of battle, even if our own life-blood sometimes flowed upon the blade.[1]

Let us now return to that analogy of the piano and the unseen player and see if we can get some more light from it than has yet appeared. In view of the last considerations which were urged in this connexion—the possibility of effecting not merely

[1] Plato, in that great dialogue, the PHAEDO, has a noteworthy passage on those who when once betrayed by Reason are apt to fall into unbelief or superstition, just as those who, when they have found bad faith among men, may fall into cynicism:—

"Would it not, Phaedo," said Socrates, "be a lamentable condition, when a certain thesis is true, firm, and intelligible, if a man supporting something of the kind should find arguments which seemed true at one time to be false at another, and in the end, instead of blaming himself or his own want of skill, should, in his ill-temper, make haste to shuffle off the blame from his own shoulders to Reason itself, and spend the rest of his life in hating and slandering it, being deprived of the truth and science of things?"

"By Zeus," said I, "it would be lamentable."

"Let us take heed then, before all else, that we never admit into our minds the idea that there can be no soundness in reasonings, but rather believe that we ourselves are not yet sound, and study manfully and with a will how to be so" (§ xxxix).

the ruin of the instrument but the more vital change of the character of the music it will perform, we must slightly alter one of the terms of the comparison. The analogy will be a strikingly close and suggestive one if we bring into view the latest development in musical mechanism, the pianola. Suppose that the music-rolls of a pianola were made of different sizes and shapes according to the different classes of music. There would then, let us say, be one kind of roll for classical music, another for Italian opera, another for Palestrinian polyphony, another for music-hall ditties, and subvarieties of all these. Now let us suppose that each pianola were so constructed as to take some particular type of music easily, other types with more difficulty, and others, again, not at all, and let us assume that all these types are continually being presented for performance. The construction of the pianola will then correspond to the physical constitution of the brain. This constitution, in each case, is the material equivalent of the dominance of a particular kind of personality, or what we have called above *aura*. But the records which have lately been so much studied of cases of what is called 'multiple personality' tend to show that in each of us there *are* several distinct personalities—or if that word seems to beg an important question as to the unitary character of personality, let us say streams of consciousness—which are pressing for manifestation. The brain selects

automatically among these, and normally keeps one particular type to the front. But just as a mechanical alteration in our hypothetical pianola might entirely change the type of music it would play, so a lesion or shock of any kind might change, more or less, the type of personality which a particular brain was fitted to express; and such cases are, of course, well known to occur.

But now we come to a fact than which none is better known, none more absolutely verifiable in experience, but to which there is nothing in the least analogous in the pianola or any other piece of mechanism taken by itself. I can, with time and toil, with patience and resolution, *change the structure of my brain* and make easy for it that which before was difficult or impossible. Within limits which cannot be defined (because human life is too short), I can even adapt it to the expression of a new type of personality. No musical instrument can do that to itself. One would have to call in for that purpose the initiating and controlling force of the man who made it.[1]

[1] Every mental acquisition, such as the knowledge of a new language, results in a definite alteration in a certain locality of the brain. The human brain, as an instrument of thought and knowledge, is, in fact, built up by a long series of purposeful efforts beginning in early infancy. These efforts do not, of course, originate in the matter of the brain itself, nor can the different nerves, which bring it messages from the outside world, carry with them anything of the nature of conscious purpose and will. These arise from Personality. I may refer for a full and very interesting treatment of this subject to Dr. W. H. Thomson's work, BRAIN AND PERSONALITY (1907).

A conscious pianola, even if we supposed it to possess the endowment of memory, would only recognize itself as a succession of sensations. The hegomonic faculty, the sense of command and control, which Plato[1] laid his finger on, as indicating the difference between a human personality and a musical mechanism, and which Hermann Lotze,[2] in the full light of modern science, still thought valid for the same purpose, would be wanting. Man does not live in the moment. As Goethe wrote in some of his greatest lines — lines that read like hammer-strokes nailing up the charter of human right:—

> Nur allein der Mensch
> Vermag das Unmögliche ;
> Er unterscheidet,
> Wählet und richtet ;
> Er kann dem Augenblick
> Dauer verleihn.[3]

Behind the mechanism of the pianola, behind the mechanism of the brain, there stands this living directive force of which we can give no scientific account whatever—we can only say that it is there. Indeed, it is just at this point that all comparison between mechanism, as usually understood, and vital action

[1] In the PHAEDO, xliii.

[2] MICROCOSMUS, Bk. II, Chaps. II and V.

> [3] Man, and man only
> Can do the impossible ;
> He can Distinguish,
> Choose, and give Judgment ;
> He to the moment lends
> Power to endure.

of any kind must break down. But the fact is that mechanism is usually not understood at all. I spoke above of a piece of mechanism taken by itself. But in truth we cannot take it by itself. Nothing in nature can be truly isolated, it only exists in relation to other things. Every machine has a soul, the soul of the man who made or who works it. Without that it would be merely scrap-iron; and even as scrap-iron it has relations with things about it—air, water, acids, and the like. In these relations we detect the soul of nature. Nothing exists by itself—nor even, permanently, *as* itself. The living universe of our experience is not a Being but an Acting and a Becoming. It is precisely this fact which, on the one hand, imposes a mysterious limit on the intellect, and, on the other, opens a boundless horizon before the will.

The human brain, the most highly organized form of protoplasm known to us, may be called in one sense a machine through which the personal will, the moral emotions, the æsthetic sense, the faculties of reasoning, have to assert themselves in action. But to say that they would never have existed but for this special form of protoplasm is to say that they were created by it out of nothing. And, no doubt, one can say that, one can *say* anything; but one cannot think it. I do not see how to represent the matter to our thought except by supposing that every stage in

physical evolution is accompanied by what has been called 'involution,' a drawing in, from the potentialities of Being, of powers and faculties of living for which the opportunity to become actual had ripened.

An image may make clearer what I mean, and I offer it only for this purpose, well knowing that "the best in this kind are but shadows." Suppose that a man were enclosed in a sheath composed of metal having certain peculiar properties: it is opaque when cold, but when heated it becomes transparent, and the hotter it is the more transparent it grows. Such a substance might easily exist, at any rate it is entirely conceivable. We must assume in addition that the heat is not such as to be injurious to the occupant. Now a man enclosed in such a sheath would, when it was at the proper temperature, see what was going on around him; he could also be seen, he could hold communication with other men, and direct operations which he wished carried out. If the sheath, in addition to being transparent at the right temperature, were also, under the same conditions, flexible, and fitted him like a skin, he could do things himself. If it got cold, however, and thereby became, in the measure of its coolness, opaque and rigid, the man would be shut off from all communication or interaction with the world outside, he would be what we call dead.

I suggest that Consciousness with all its attendant

phenomena is represented by the man, the sheath is Matter, the heat is Life. Matter, historically, precedes the manifestation of consciousness, but as it is never without a certain degree of life, so, even in the nebular form in which it exists before it has cohered into worlds and systems, it is not without the element of directivity, of harmonious inter-relation and interaction. A higher organization of life makes possible the subtler sensitiveness of the vegetable kingdom. The most vital, the most highly organized form of matter we know is the human brain and nervous system. Here the sheath has assumed a considerable degree of transparency and flexibility. But doubtless a far higher degree of organization is possible, and when this is reached the capacities of consciousness will have developed to an extent altogether inconceivable to us at present, though every now and then some exceptionally constituted individual gives us a hint of stages of development as yet far beyond the capacities of the race in general.

We may conceive matter, then, as being constantly fanned up into the heat of life, *i.e.* as elaborating forms into which consciousness can enter and through which it can act. And we observe that consciousness, when it has found a suitable form, can act on it and improve it. Two questions now arise. The first is: Why should consciousness have need of these forms at all? And the second is: If it has this need, what becomes of the individual consciousness when the

form has grown finally cold in death and is resolved into its inorganic elements?

To the first question I cannot suggest any answer, except the obvious one that an individual consciousness must have some forms through which it can have relations with things not itself. In the world, as we have it, it is *generally* true—it would be unwise to venture any absolute statement on the subject—that consciousness only enters into relation with another consciousness, or with matter, by means of the peculiarly organized form of matter which we call a brain. I must leave the question there. Thought and research, and the advance in physical organization which I have referred to, may, in the near or distant future, throw further light upon it. It is not a difficulty, but it is certainly a mystery.

As regards the second question, that of personal immortality, all we are justified in concluding on the negative side is that when a certain body and brain have perished, consciousness can express itself through *that* form no more. But consciousness itself cannot be less indestructible than everything else that exists. We may, so far as I can see, either conceive an individual consciousness at death as being resolved into the general consciousness from which it sprang, even as the matter composing any organic being is resolved into inorganic matter, or we may suppose that, having won and consolidated its selfhood by what it has done and what it has

endured in the flesh, the selfhood is thenceforth capable of an independent existence under forms at present beyond our ken.

Either of these conceptions implies what we call the 'immortality' of the soul, the real and permanent significance of the experiences of the soul. Here a little further elucidation may be desirable. I have spoken of the possibility of the soul or self being resolved into something which one can only describe as a general spiritual substance related to individual souls as matter in general is related to particular material organisms. But the parallel with matter must not be pushed too far. A material organism, being composed of different substances, can be disintegrated. But consciousness cannot, strictly speaking, suffer disintegration, for it has no different substances into which to disintegrate. It can, however, as we see, appear in the form of a number of different personalities; and this, the normal existing condition, is the psychical analogue to physical disintegration. If these personalities are again to merge into one impersonal consciousness, the process would not be comparable to disintegration; it would be the very reverse; it would be reintegration; and the process, therefore, implies nothing resembling the loss or dissipation of any form of psychic being.

Further, we have to observe that when a material organism perishes and is disintegrated, there is, so far as we can see, an utter and complete end of it. The

human brain, for example, quite apart from its association with a consciousness, has in the course of its development and activity gone through a marvellous chain of processes, in which electric and molecular force, undulations, radiations, and probably other physical factors of which we have no conception at present, have played a part. Yet when the brain dies and is resolved into so much ammonia, phosphorus, carbon, gases, and what not, these elements differ in no whit from other ammonia, phosphorus, and carbon in the world. For any ulterior purpose they are neither better nor worse; they are wholly unchanged, by all the extraordinary history which they have passed through under the spell of life. This is equally true of the elements, nervous and other, of any living being. But the physical system of every living being below man is organized for two ends only: (1) the upkeep, during its lifetime, of its own physical powers; (2) the reproduction and multiplication of its kind.[1] When an organism has fulfilled these functions, it is justified; the object of life has been attained. These functions, of course, persist in man, but he has added to them many others; his brain has to serve him for ethics, art, philosophy, religion, and is therefore organized with a subtlety quite unknown in the animal world. Here, then, is a kind of organic action which has no sig-

[1] This includes the nourishment and protection of its young while helpless.

nificance whatever *except in relation to consciousness.* If it have none there it has none at all, it is absolutely irrational and futile. Now the molecular and other action of a beast's brain has reference to its physical life, and it passes on this physical life to its descendants. But the action, or a great part of the action, of a man's brain has reference to his consciousness, and of this he passes on at most the potentiality. A lion's cub is a lion ; a philosopher's child is not necessarily or even probably a philosopher. That path of development, whatever we may say about the lion, must have its goal elsewhere. We must, if the universe is not irrational, believe that in some way consciousness, whether after the death of the body it persists in individual form or not, *carries forward into the new state the results of its experiences, its acquisitions, its losses, in the bodily relation.* These are not transitory, not indifferent ; "great or small they furnish their parts toward the soul."

The reader will have probably noticed that one consideration of the greatest moment has been left untouched. I have spoken of matter and consciousness as of two separate things, and of the former as prior to the latter. This is a form of thought imposed upon us by the space and time relations by which our being is conditioned. But it is evident that the interaction of the two cannot be fortuitous. We cannot suppose that matter pursued its long

course of evolution, refining and subtilizing at every stage to admit more and more of the activity of consciousness, in total disconnexion with that consciousness. The two must be co-ordinated in some higher synthesis. Could we escape from the limitations of our thought we should see them, therefore, not as two, but one, and we should see that the meanest form of being has an aspect in which it belongs to eternity.

CHAPTER VIII

THE ETHICAL CRITERION

"Things have life—God is life."—SPINOZA.

"I am come that they may have life, and that they may have it more abundantly."—RABBI BAR-ELAHIN.

THE view of the meaning and purpose of cosmic development set forth in the preceding chapters must clearly have a bearing on the principles of human conduct. Men above a certain stage of culture do not live by blind instinct. They endeavour to harmonize their lives with some conception of the *ratio essendi* of the world in which they find themselves, and in so doing they are most truly men. The Stoic expressed this attempt in the simple formula, 'Live according to Nature.' But nature is not simple, and the endeavour to interpret nature has led to some very divergent ideals of human conduct.

Every one who has meditated on the subject at all has become aware that the world which we see and hear and feel, the world of sense-perception, is not all that we have to do with. Behind the visible and material world there lies the invisible, the *X* world, which we cannot weigh and analyze, but the existence

and potency of which we are compelled to assume. It is the literal truth to say that no man can take a single step even in the most mundane and practical affairs of life without a belief, implicit or explicit, in the spiritual unity and reality underlying the fleeting panorama of sense-impressions. Nothing else can give him any assurance of the constancy, the orderly interrelation, of the phenomena with which he has to deal, and with which he could not deal intelligently did not this constancy exist. Now when man begins to be aware that there is something more in the world than is immediately apparent to sense, his thinking on the subject may take several different lines, but it is probable that all of them may be referred to one or other of two main divisions, the Dualistic and the Monistic.[1] The Dualist will regard the world of sense-perception, whether originally produced and organized by the invisible or not, as now more or less independent of the latter, or even hostile to it, and he will generally interpret his own being as something properly belonging to the invisible world but for a time mysteriously and unhappily entangled, through the flesh, with the other. This is Platonic theology, carried by Paul into Christianity, and it eventuates, when driven to its conclusion by a rigorous and inhuman logic, in Asceticism. Instead

[1] This word is, I believe, used by Prof. Haeckel to describe his system of philosophy. I am very imperfectly acquainted with that system, and therefore think it well to note here that the term must not be taken with any special implications which Haeckel may have attached to it.

of the Stoic, 'Live according to Nature' (a formula in complete harmony, it may be noted, with the Stoic Pantheism), we get, as the formula for ideal conduct, 'Deny Nature, think the flesh a burden and a shame, fit yourself for the time when your real self will cast it off as a filthy garment.'

On the other hand the Monistic view represented in ancient Europe by the great Stoic school, and in modern times by names such as those of Spinoza, Hegel, Schopenhauer, Lotze, Walt Whitman, refuses to separate the visible and the invisible worlds. The former *is* the latter, made partially accessible to our minds. Man is a part of nature, bound up in all his being with the framework of the Universe. The flesh is not a bond on the spirit but an instrument of life, and what we acquire through it is just as valuable and as eternal as anything else. "Objects gross and the unseen soul are one," says Whitman—the distinction between subject and object, the perceiver and the perceived, as Schopenhauer argues, is but a mode of cognition.

That the human mind can rest only in some kind of Monism, that Dualism must be regarded as a natural but a passing phase of thought, based on a hasty interpretation of certain aspects of man's moral experience, would seem to follow from what has been urged previously from the *a priori* side of the question.[1] Indeed, it may be doubted whether

[1] See pp. 17-20.

there are any thinkers who seriously maintain the Dualistic view as a philosophic doctrine. Many, however, including the whole school of Catholic theology, with its ascetic ideal and its doctrine of eternal hell, turn practically Dualist in the sphere of ethics, while they would be horrified at a suspicion of anything but the purest Monism in their conception of the ultimate reality of being. The cause of this inconsistency is evident. We feel instinctively that no distinction in the world of our present experience goes deeper than the distinction between moral good and moral evil. We feel the danger of obliterating this distinction, and setting loose the greedy and violent passions of man to work their will unchecked by any sense of right and wrong. And undoubtedly the Monistic principle might, by a shallow interpretation of it, be held to obliterate the distinction. If God is One, it might be argued, and God is All, then evil is justified in the world equally with goodness, and the sense of duty is, what shall we say? an illusion, a superstition, a relic of fetishism. Hence the practical Dualism on the ethical and eschatological side which has found its way into Monistic thought. It is brought in to save morality. But inconsistencies like this do not last for ever; they can only persist where thought has become atrophied, and Dualism is now rapidly disappearing from the religious thought of Europe. What is to take its place? The problem before us is to discover

a basis for ethics on the Monistic hypothesis without the slightest acceptance of the facile solutions offered by Dualism. If we succeed in that, and establish a real Monistic meaning for the terms *right* and *wrong*, we shall next have to deal with the sanction of the law of righteousness, and to show *why* it should be obeyed even, if necessary, at the cost of pain and death.

And first, let us unreservedly admit that on the Monistic view the distinction between right and wrong, moral good and moral evil, is not fundamental. Both must be regarded as moving towards comprehension in some unity as yet unimaginable by man. Without renouncing his faith, the Monist can never escape from that position, and he must be true to the light whatever the apparent consequences may be. A greater Power than he will look after the consequences: ταῦτα τῷ θεῷ μελήσει.

But, on the other hand, this distinction may be just as real and vital as any other in the world of experience. Nobody thinks that pleasure and pain are indifferent because they are both necessary forms of active life, or that beauty and ugliness are indifferent, or that success and failure are indifferent. How we strain for success in a game, for instance, although we are perfectly well aware that the game is the real object, not the triumph! Yet without the possibilities of triumph or defeat, there would be no game. The

problem is really part of the primal mystery of the origin of cosmic life. If we assume at the beginning of things (so far as we can conceive a beginning) one infinite, homogeneous, absolutely undifferentiated Existence, and then conceive this Existence as impelled to act, and to become conscious of itself, it is plain that to do so it must differentiate itself. There must arise within it the relations of subject and object, simple and complex, better and worse, and all that is involved in change, variety, progression. And this applies as much to the moral life as to the life of the senses. It has often been pointed out that if there were no Wrong to strive with there would be no visible and active Right. Were there no hate, love would be incapable of the noblest part of its ministry. Were there no weakness, strength could never have been called on for the strain by which it is developed. And if good should ever overcome and absorb evil the stage thus attained will assuredly reveal some new contrast of pursuit and avoidance perhaps as strange to us now as moral distinctions would be to the lower animals.

The Monist will also urge that nature, as we behold it, is not a fixed and rounded entity, but is something in process of completion. We must therefore interpret nature not alone by its contents at any given moment, but by its drift and tendency. This is precisely the consideration which separates Pantheism as enlightened by science from the Pan-

theism of a primitive nature-worship. In it, the Greek and the Hebrew ideals are blended and reconciled.

But what, for ethical purposes, *is* this drift and tendency? What significance do I mean to attach to the terms moral good and moral evil? It is hardly necessary to say that I do not propose in a couple of chapters of one short book to elaborate an ethical system with all its groundwork, and with details ramifying into every branch of ethical action, as Mr. Herbert Spencer has essayed to do in his DATA OF ETHICS. All I can do here, or in any section of this book, is to indicate a *way* of looking at things—at nature, at human life, at art—in which the meaning of the universe has seemed to become intelligible and satisfying to my own thought. Having found the way, every one must use it for himself or herself. I can, in the present work, go no further into detail than is necessary to make my meaning clear; to set whatever readers I may find at my point of view. If I can at all succeed in doing this, let them use their own eyes: they will find a wonderful landscape, vital, fresh and boundless, opening before them.

The conception of ethical law which I wish to put forward differs from what is commonly understood as evolutionary or scientific ethics at the present day. This system appears ultimately to rest on Jeremy Bentham as its founder, but Bentham's later disciples have modified his doctrine at various points by a

deeper appreciation of the difficulties of the position. They have approximated more closely to what I consider to be the truth, but they have never shaken off the entanglement of the original false position of the modern founder of the school. Bentham, who pursued "the greatest happiness of the greatest number" through the medium of the most depressing system of philosophy which the world has ever known, made Pleasure the ultimate criterion of moral action and declared for the summary striking out of the word 'ought' from the language of morals, as corresponding to an idea which, so far as it rested on any reality, was merely a relic of primitive superstition.[1] But J. S. Mill saw that the sentiment of duty and moral obligation was based on something deeper and more instinctive than a word misunderstood, and that it often survived in persons singularly free from superstition. He sought its origin in the psychology and physiology of man, and interpreted it, on the principle of association of ideas, as a survival of the deep impression made by punishments and rewards attached respectively to different classes of actions in each man's early life.[2] The position was a more rational and scientific one than that of Bentham, but it still failed to account for the *a priori* character of the moral sense, the ready responsiveness with which early training evokes in man the sentiment of duty.

[1] Deontology, I, p. 32.

[2] Examination of Hamilton, pp. 586 *sqq.*

It seemed, as it were, to have been somehow *prepared beforehand* and to lie latent awaiting only the right touch to spring into action. Finally, Herbert Spencer, who may be said to have brought all this line of thinking to its climax, seized on the evolution doctrine as explaining this intuitive and innate quality of ethical feeling. It *was* prepared beforehand, far back in the ancestry of the race. Not the punishments and rewards applied to the modern individual in his own person, but those which affected his near and remote progenitors, had, in the course of countless generations, built up "moral perceptions" resulting from "inherited modifications caused by accumulated experiences."[1] The moral sense, therefore, is *now* really innate because inherited, but was once acquired by the operation of pleasures and pains arising from man's intercourse with nature and with his fellows. And the ultimate moral criterion in the present day remains simply the striking of a balance between pleasure and pain.[2]

It is clear that if the Lamarckian doctrine of the inheritance of acquired characteristics is a delusion, the bottom is at once knocked out of the Spencerian system of ethics. But apart from this, that system,

[1] DATA OF ETHICS, § 20.

[2] "I conceive it to be the business of moral science to deduce, from the laws of life and the conditions of existence, what kinds of action necessarily tend to produce happiness, and what kinds to produce unhappiness" (DATA OF ETHICS, § 21). Happiness is always taken by Spencer as equivalent to pleasurable feeling.

on the historical side at least, is vitiated by the cardinal defect in Mr. Spencer's mind—his failure to appreciate the true nature of the data with which he had to deal. The philosophic mind is not a mere logic-machine. It must include the faculty of vision, the vital perception of the objects of thought, as well as the faculty of observing and of generalizing about their action and reaction on each other, and from this point of view Mr. Spencer's deficiency as a philosopher is enormous. A vital perception of the object in this case makes us at once aware that you cannot evolve a sense of Duty, "stern daughter of the voice of God," out of pleasures and pains. Pleasures and pains *per se* will yield nothing to the end of the chapter but the sense or the recollection of pleasure and of pain. It is as impossible in psychology as it is in mechanics to juggle more power out of the end of a sequence of causes and effects than you put in at the beginning.

But what has a natural ethics to put in the place of pleasure as the goal of right action? The question is answered when we ask, What does Nature herself put? Nature is said to have no morals, yet a mother bird will imperil and often lose its life for the sake of its young. Is it seeking pleasure then? Certainly not—it is protecting and fostering life, the life of the race. And here, as we have insisted so often, is the master-impulse of nature. We are taking a false and contracted view

when we assume that a living thing can have no other goal of action except pleasure. Far earlier than the appearance of man in the world is the appearance of the social instinct which prompts the individual to live, and if necessary to die, for the larger life of the race. What really begins in man is the power to think of himself, to choose, to analyze, the power to say, Why? To this question the science of ethics must provide an answer if it can—that, in fact, is its origin and function. But if it binds itself to provide an answer in terms of pleasure, it is entering the lists with naked Egotism at a fatal disadvantage. On that ground, it seems to me, Egotism must always win. But it is not the only ground. Nature knows a whole world of impulse and effort which has nothing to do with pleasure. *Nature does not directly want pleasure at all, but is resolved, at the cost of pleasure and everything else, to have life.* Now life is maintained at its highest point by *harmony*—a harmony of the faculties with each other and, as a whole, with the mighty life outside them. And, as Santayana admirably says, "harmony when made to rule in life gives reason a noble satisfaction which we call happiness. Happiness is impossible and even inconceivable to a mind without scope and without pause, a mind driven by craving, pleasure, and fear."[1] In this sense we may say that happiness is organically connected with

[1] Reason in Science, p. 252.

right action.[1] But right action in itself is simply the action which best subserves the central purpose of nature. If that purpose is summed up in the one word Life, we must think of the moral sense, if we would not go astray and be bewildered, in terms of living and not in terms of enjoying. To take the greatest of exemplars, who can venture to affirm that Christ had more pleasure living as he did and uttering to the last syllable the message that was given him to deliver, than if he had prudently restrained himself and led the life of a decent and respectable artisan in his Syrian village? Indeed, even if we take very long views, who can affirm that, on the whole, he has by his life and death increased the sum of pleasure in the world? I doubt it very much. No one can deny that it is most questionable. To think of the matter in terms of pleasure seems to lead to nothing but perplexity and doubt. But there can be no doubt whatever that he lived to the full the life that it was in him to live, and that he immensely deepened and enriched the spiritual life of man. When we fix our minds on life as the goal and depth and fulness of life as the criterion, we come out at once into the clear light where high inspirations are born and justified. But it is not only the conception of life as existing for pleasure that I

[1] See DATA OF ETHICS, p. 36. It has been proved by exact physiological experiment that happiness promotes healthy vital action in the living organism, and that sorrow and pain depress it. But of course human life is not conducted solely on the physiological plane.

think a true ethics will repudiate. We must clear our minds of the idea that life has any goal outside itself—pleasure, moral discipline, or what not. We must fully realize the conception of life as its own goal, its own complete satisfaction and justification. Whoever has done this will feel as if he had escaped from a jungle of contradiction and gloom, where man can only live at all by clearing some little space for his church and his homestead, and giving up the rest to the powers of darkness. Yet a step brings him to a point of view from which the physical, the animal and the human features of the world's vast landscape seem to flow into a happy and organic union, where every part becomes luminous with meaning and charged with divine purpose.

Moral action then, I conceive, as a *certain kind* of life-promoting action. It is action which promotes life in the whole as opposed to the part, which sacrifices the lower, narrower, more immediate life for the fuller, nobler, more permanent life, whenever they are found to clash. It does not differ in kind from other wholesome vital action, but it differs in the heightening, the saliency, the intention conferred upon it by the circumstances under which it is taken. And if we ask how it was evolved in man, the answer is that it was there already in the instincts of the lower animals, which are never, as man often so sadly is, at odds with their true functions and duties. It is not morality which has been

evolved in man, but the capacity for immorality, due to his personal self-consciousness.

The ultimate question, then, as regards the abstract morality of any act or class of acts must be, Does it make for life? Does it tend to help man towards the maximum development *of all his faculties and capacities?* These faculties and capacities are what the universe has now evolved at the highest level of which we have any knowledge. None of them is evil, except in so far as it may thwart and stunt the development of others. In the harmony of the whole range of man's powers of sense and spirit lies the golden ideal which none of us may realize, but for which each of us may strive; or—for such is the supreme and fatal prerogative of man—which he may set himself to dishonour and deny.

CHAPTER IX

THE ETHICAL SANCTION

> "Far, far, how far? from o'er the gates of Birth,
> The faint horizons, all the bounds of earth."
>
> TENNYSON.

ETHICAL philosophy centres on two main points—the ethical criterion and the ethical sanction. We have to ask ourselves, What kind of life ought I to live, and secondly, Why ought I to live it? The first of these questions we have answered simply thus: Life is self-justified; in merely living we fulfil the whole purpose of nature; and as life is a thing admitting of degrees it follows that that life is best in which there is most of life. But this does not mean apparent life for the individual at the present moment. It means most life for the Whole, so far as the individual acts upon the Whole. And he acts on it in two ways—first (one which is often overlooked) by *living his own life* which is equally a part of that Whole whether he lives on a desert island or in the heart of a city; and secondly by the influence he radiates on other lives with which his own is socially related.

This, it is clear, is quite the same thing as to say that the right life for any man is that in which *for him* there is most of life—the richest and the fullest life—*if he were to go on living indefinitely.* For whatever depresses or exalts life in the Whole must ultimately depress or exalt it in the individual also; the two interests are clearly identical *in the long run.* This 'long run' or universal point of view, which makes identical the interests of the Whole and the interests of the individual, gives to a natural ethics the criterion for all human action. It gives the contents, though not the cogency—with this we have to deal in the present chapter—of the word 'ought.'

By the mere fact of his social relations with other men each individual is continually being trained to take this view, to harmonize together his egoistic and his altruistic instincts; and is continually amassing a store of social experiences out of which a universal moral code is gradually shaping itself. "Life," it has been well said, "has saved up much wisdom." Ethical wisdom, in this regard, will clearly involve such kind of action, of organization, as will afford to each individual the fullest opportunities for vital development in mind and body.

The life in which there is most of life! By holding fast to this clue we shall, I think, see our way through many of the obscurities in which, partly by the search for an extra-natural basis of morality, partly by the reactionary attempt to base morality

simply on the striking of a balance between pleasures and pains, the philosophy of right and wrong has been involved. We get a natural basis for establishing a scale in human action, a distinction between 'higher' and 'lower,' without which a philosophic ethics is clearly impossible. I do not, of course, mean to say that it is possible to apply a mechanical rule and measure to moral action in the manner of Catholic casuistry, according to which it is a venial sin to steal 19s. 6d. but a mortal sin to steal £1.[1] Still, the existence of a natural scale is evident at once when we consider the fact that man is constantly being placed in positions in which his action may either thwart and depress life, or simply maintain it, or markedly enrich and extend it. The ethical quality of his action appears to arise from the fact that it is possible for him, under the impulse of immediate personal gratification, to do things which if commonly done by men would destroy the beauty and order of human life. The interests of the whole and of the individual may be identical, as we have said, in the long run, but at the moment they are often in violent conflict. Allowing for the fact that it is never possible in nature to draw

[1] *Sic*, Fr. Slater, S.J., in the *Irish Ecclesiastical Record*, February, 1905. "If such a sum [£1] could be stolen without grave sin, its amount would prove too great a temptation for the virtue of large numbers of people who wish to save their souls, but make little of venial sins" (p. 109). But Fr. Ojetti is much more liberal to persons of the class described, and gives them up to £4 (p. 100).

a sharp dividing line between different classes of being, and to say absolutely that things are *thus* on one side of it and *thus* on the other, we may repeat that this opposition between the long-run or universal and the momentary or personal interest is a characteristic of human life as opposed to that of the lower animals. It arises from the strong sense of individuality, of selfhood, which emerges in man and of which the animals know little or nothing. In itself it is a new and noble power of life, but it has its fatal and mischievous aspect. Without it we should know neither good nor evil. Personality is at once man's pride and his fall.

With this sense of selfhood there have grown up in humanity the faculties of Conscience and of Will. Conscience I interpret as the sense of what is due to the Whole, to the nobler and more permanent self. Inasmuch as man is only gradually discovering what it really is that the Whole demands of us, it follows that the utterances of conscience may be misdirected, and that they need to be corrected and purified by intelligence and experience. We see here an example of that principle of the combination of evolution and involution which alone seems to make intelligible the development of life. Never, by organizing into a social system a multitude of individual appetencies, can one produce a moral sense, a conscience. But neither is conscience concerned to give the true laws

of that organization. It adds its peculiar *numen*, its sanctity, to every effort to

> Set up a mark of everlasting light
> Above the howling senses' ebb and flow,

and though the mark itself may, indeed must, shift and be transformed with the ripening insight of man, yet, as between it and the temptations of sense, conscience must always be obeyed. Now as nature is organically one, we should expect to find this truth not dependent merely on an intuitive perception but written in the experiences of life. And is not this exactly what we do find? The ethical ideals of Judaism, of Hinduism, and of Roman Catholicism, with their extreme reliance on external observance and ritual, are lower, no doubt, than those of Christianity as conceived, say, by St. Paul. Yet let a Jew or a Hindu turn Christian, or a Catholic turn Protestant or Freethinker, for the mere sake of material advantages or an easier way of living, and a general moral deterioration seems at once to set in.[1] Whenever a man allows his sense of personal ease and gratification to overpower his sense of what is due to

[1] I may draw attention in this connexion to a striking and valuable study of the effect of American democracy on Jewish immigrants published in the *Times* of January 4, 1908. As regards Catholicism, it appears from a comparison of the statistics of emigration from Ireland with those of Catholicism in the U.S.A. that about 50 per cent of the Irish Catholics abandon their religion in the New World. The Irish are also shown by the criminal statistics of the States as well as by the observation of students of the criminal classes like Mr. Josiah Flynt, to furnish a far greater proportion of criminals in that country

his fellow man, to his own higher self, to his God, he weakens his will and his capacity for living the nobler life. Ultimately he destroys the capacity altogether, and with it vanishes even that for which he sinned, the capacity for pleasure itself. The poison of self-indulgence will slacken and corrupt every fibre of his moral and physical being. To grasp at pleasure indiscriminately, recklessly, greedily is a way that makes not for life but death. On the other hand, the capacity for renunciation and self-control, the following of the law of love, the passion for justice and equality, not only grow strong by exercise but, far from injuring the other capacities which it may, on occasion, be right to suppress for their sake, they rather intensify these. As self-indulgence corrupts and fatigues the whole man, even on the self-indulgent side, so duty and righteousness vitalize and brace the whole man, both on their own side and the other. For Nature is one—sweet and mighty are the powers which conspire to create the harmony she loves in the spirits faithful to her world-wide revelation.

than obtains in the case of any other nationality contributing to its population. Yet they also give to American life some of its very best elements, and they are notoriously the most crimeless of people at home. The degradation of character commonly produced by Christianizing the Hindu is so uniformly attested by residents in India that it cannot be discredited. See, in this reference, an article entitled 'The Failure of Christian Missions in India,' by Dr. Josiah Oldfield, *Hibbert Journal*, April, 1903. Of course it may be said that the original error lies in the identification of ritual and observance with religion and morality.

Now since the moral faculties bear this common stamp upon them, that they are those which oppose to the temptations of personal gratification the sense of duty to something outside ourselves, and since, when these two clash, the claim of the moral law is always to be obeyed, it is inevitable that men will sometimes take the denial of personal gratification for an end *per se* and attach to it a notion of peculiar holiness and purity. And this error will be intensified by the ancient and inveterate habit of regarding the Supreme Being as a malignant Power, to be propitiated by suffering. Thus we get the false sanction with its Ascetic ideal which has appeared so often in history. It is the other extreme to licence, and rests equally on disregard for the rational ideal of Sophrosyne or Temperance which lies between them. Yet it may truly be said that asceticism has its due place in the world. The ascetic life cannot indeed be the ideal life for any one who holds that plenitude of life is the true ideal. But it may be the best life for this or that individual. A nature maimed or scathed from birth, or by unhappy fortune, may best be able to realize itself in complete withdrawal from the interests of ordinary social life. Such withdrawal may also be necessary for the pioneer or leader of a cause, for a great reformer, for a teacher absorbed in his mission.

Philosophy, in fact, has its saints and ascetics as well as any religion that rests on extra-natural sanc-

tions. But in each case the ascetic ideal rests on quite a different basis.

Looking broadly at the part which religious Orders have played in the religious and intellectual history of Europe, it may well be doubted whether even the most gracious and human figure in the history of asceticism, Francis of Assisi, would not have better served his time and land by the natural development, in secular life and activity, of the beautiful if sometimes wildly ebullient character portrayed in the records of his youth, than by cutting away half his life in order to force the other half into a distorted rarity. In recognizing the beauty and sweetness of his nature let us not be misled into attributing it in any degree to the influence of that fatal miasma from a faith more ancient than any religion which has a name and place on earth to-day, the dim terror of the unseen which has embodied itself for ages in expiatory sacrifices and rites of blood and pain.

Had Francis not been a saint he would certainly have been one of his country's greatest poets.[1] Different minds will probably estimate differently the loss and gain. As a poet he produced the 'Canticle of the Sun'; as an ascetic, the Franciscan Order. Now it is fair to point out that this, like other Orders of his church, must not be judged by what it is like in times when it is surrounded by watchful and by no means adorant eyes. A Catholic religious Order in a

[1] See Appendix D.

Catholic country naturally lives and moves in an atmosphere of veneration. To preserve this atmosphere pure from the sceptical thought which, from the monastic point of view, would vitiate it so dangerously, is naturally a prime object of every religious community; hence the bigotries, superstitions, and tyrannies of which these communities have so often been the sources or agents, from the days of Hypatia to the days of Dreyfus. Such communities, developing themselves under such circumstances, cannot attract many men of intellect and character to join them. They rapidly deteriorate, and European literature from Boccaccio and Chaucer to Erasmus shows us the repute in which they come to be held by the uncloistered intellect. A false ideal may stimulate, but it poisons. St. Francis, dreaming that he serves God by making himself blind to God's world through a course of pitiless austerities,[1] produces an Order whose licence in one generation after his death has become a scandal to Christendom.[2]

Let us turn now to the theory of asceticism as

[1] "Per l' asprezza della penitenza e continuo piagnere, era diventato quasi cieco, e poco vedea."—FIORETTI, III. He had "wholly shattered his body," says Thomas of Celano (SECOND LIFE of St. F., Ch. CLX.).

[2] A discussion of the subject, with special reference to the rapid decay of the Franciscan Order, will be found in Mr. G. G. Coulton's paper 'The Failure of the Friars,' in the *Hibbert Journal* for January, 1907. See also criticisms on this paper by two English Franciscans, Friar Cuthbert and Friar Stanilaus, in the same journal for April, 1907, and Mr. Coulton's rejoinder, July, 1907.

conceived by the humane and rational spirit of Stoic philosophy. Epictetus—to my mind the greatest ethical thinker of antiquity—has a valuable and carefully reasoned chapter on the subject in his DISSERTATIONS. In reading this after, let us say, THE LITTLE FLOWERS OF ST. FRANCIS, one seems to pass from the drugged atmosphere of a mediæval church to the free air and sunlight of the world. The ascetic, or Cynic as he was called in Stoic phraseology, is painted for us as a man who adventures himself to the extreme limit of abnegation, not from any mystic sentiment of the holiness of pain and poverty, but simply to help himself and others to realize the soul's independence of external things. It was a cardinal doctrine of Stoicism (as it was of the Christianity of Christ) that the things which a man wrought and thought, the things under the control of his will, were the only things that really mattered. What happened to a man from outside was, indeed, of great importance in regard to how he dealt with it; in itself it was of none; it was like a ball in a game which you have to do your best to catch, knowing well that you do so not for the sake of the ball but of the game. Such was the Stoic view of life, and the Cynic represented not the perfected Stoic, not an ideal towards which all should tend—for the ideal was that of citizenship and well-ordered social life—but simply the method of verification which consists in taking an extreme case and showing that

one's theory will fit in with it. And so Diogenes lived in a barrel instead of a house, and asked nothing of Alexander except to stand out of his light. It is not more pleasing to God, not better in any way, that a man should live in a barrel rather than in a house, that he should be single rather than married, poor rather than rich; yet in the chances and changes of this mortal life all these things may happen to a man, will he, nill he, and the point is to show that he may still be confident and cheerful, knowing that his true self is untouched by these calamities. And while St. Francis and the more devoted of his followers so tortured and wrecked the body which St. Paul had called the temple of the Holy Spirit that many of them perished or had to linger out their lives in the infirmary,[1] with the Cynic the cultivation of the body and its faculties was a part of his discipline.

"For," says Epictetus,[2] "if he shall appear consumptive, meagre and pale, his witness hath not the same emphasis.

[1] When the ascetic ideal is regarded as admirable in a saint, it naturally leads to still more lamentable perversions by being practised by persons who have never withdrawn themselves from ordinary social relations. Thus a Catholic priest has lately given as an instance of the "spiritual tendency and unworldliness of the Irish peasant" the case of a farmer's wife, the mother of a large family, who, by a long course of secret austerities, brought herself "to an untimely grave, and, no doubt," adds the reverend author, "a martyr's crown." To keep herself in health and do her duty to her husband and children would, it appears, have been "worldliness." Such cases, we are told, are not uncommon. (SCENES AND SKETCHES IN AN IRISH PARISH, by the Rev. J. Guinan, C.C., 4th ed., 1906, p. 87.)

[2] THE TEACHING OF EPICTETUS, by T. W. Rolleston, p. 36. DISSERTATIONS, III, xxii.

Not only by showing forth the things of the spirit must he convince foolish men that it is possible, without the things that are admired of them, to be good and wise, but also in his body must he show that plain and simple and open-air living are not mischievous even to the body: 'Behold, even of this I am a witness, I and my body.' So Diogenes was wont to do, for he went about radiant with health, and with his very body he turned many to good. But a Cynic that men pity seems to be a beggar—all men turn away from him, all stumble at him. For he must not appear squalid; so that neither in this respect shall he scare men away; but his very austerity should be cleanly and pleasing."

How sane and wholesome, how wisely adapted to the fundamental facts of life, is the Stoic ideal as compared with the monastic! In it we see that there is a place in a natural ethics for a rational asceticism. Of such there will always be need—we must admit, whatever we may think of the 'spirituality' of self-destruction, that there are, and are always like to be, many more men and women who deteriorate in soul and body through petty acts of self-indulgence than who do so by an excess of austerity. And this makes it all the more necessary that the matter should be conceived rightly, reasonably, from the side of a reverence for life and its manifestations, not from that of disdain and repulsion; that we should take hold of it (to quote Epictetus again) by the handle by which it can be carried, not that by which theory and experience alike have shown that it never can. When Tennyson wrote "Move upward, working out the beast," he

was not so well inspired as in some of his other appreciations of modern science. The religious ascetic aims at working out the beast—not so Nature, who does not progress by substituting one form of living for another, but by growing from a central core and continually harmonizing the old radical elements of being with the new assimilations. One *can*, perhaps, work out the beast—what cannot the will achieve? But the beast surely avenges himself, and often in terrible fashion.

When, however, we have recognized the false sanction and the false ideal associated with it, we have still the more difficult problem of establishing the true. If Righteousness—to use that term for all kinds of action ethically right—is to be followed in the interests of life, how can it ever be required that much suffering, and even death itself may have to be faced for its sake? Man is a part of a Whole—in the effective realization of that conception all ethics is summed up—but he is also an individual. Why should the individual give way to the Whole if their interests seem to clash? In other words, though we have the contents, the static significance of the word 'ought,' we have still to find its dynamic significance, its cogency.

Every beast does what it 'ought' without any question, and this constantly involves acts of cooperation or self-sacrifice for the interests of the race.

In man, ethical action has a greater value for life, simply because, unlike the beast, he is able to question its grounds and to forgo it if he chooses. He observes, as we have said, that the 'long run' or universal point of view is often in conflict with the individual point of view. "Let us eat and drink, for to-morrow we die" is the extreme expression of the individual point of view. It has been called a 'pig-philosophy,' and if the expression is just, it is not because the pig will die to-morrow, for it will probably live as long as anything else, but because no matter how long it lives it is, *qua* pig, incapable of any other form of life.

But a man is capable of other forms of life, and to realize these he must keep the pig-life in check, not despising or disowning it, but restraining it, lest it should throw him out of harmony. Unchecked, it will do that in the long run; but what if he is to have no long run? Where the lower life can yield an hour of delight, why deny it for the sake of a higher life, if in the next hour both must end together?

I confess that I see no escape from the implied conclusion if the premiss is true. But if the view of life outlined in these pages be true, then this premiss is palpably false. Neither the higher nor the lower life can ever have any end, though no doubt they may pass into forms outside the category of Time, in which the terms beginning and end have

no longer any meaning. Life is not dependent on its visible and tangible forms. The question here involved is one on which the drift of certain modern speculations in physics obliges us to dwell for a little.

The question of the present inhabitability of Mars or other planets has been much debated of late, pro and con. Opinions differ on this point; but there is a very general agreement among physicists that the state of the moon, cold, dead, and barren as a burnt-out cinder, must, by the equalization of energy, be sooner or later the necessary fate of every planet and of every sun in the universe. Science has thus apparently come to justify by its solemn verdict that cry of the Latin poet, more charged with the pathos of eternal death than perhaps any other human utterance:—

> "Soles occidere et redire possunt:
> Nobis, cum semel occidit brevis lux,
> Nox est perpetua una dormienda."[1]

The conditions under which life is possible will then no longer exist. One nothingness awaits the saint, the sage, the ox, the oak tree, and the fungus. "Life," says Le Dantec, "has not always existed on the earth"; we are to regard it as merely "a sur-

[1] Suns that have set return as bright,
But we, when sets our little light,
Sleep on through one eternal night.—CATULLUS, V.

face accident in the history of the thermic evolution of the globe."[1]

This remark, which is one that a thermometer might be expected to make if it could talk, is in Le Dantec's mouth probably no more than a little rhetorical fling at orthodoxy, for it is really answered by his whole book. His main thesis is "the absence of all essential difference and all absolute discontinuity between living and not-living matter." "A surface accident" can hardly be a reasonable description of a development thus prepared for in the essential nature of the substance of the world. But other physicists have lately cut deeper, and will not allow the suns of Catullus, even when cold, to set and rise again for ever. According to the very interesting and apparently well-supported speculations of Gustave Le Bon,[2] all matter is at present engaged in that process of disintegration of which radium offers the most conspicuous example. The energy which produces life and response of all kinds is explained as simply the result of this long, disintegrating process, and may be compared to the action of a released spring, seeking its state of quiescence and immobility.[3] When the process is complete, matter will be

[1] The Nature and Origin of Life, by Felix Le Dantec, p. 22 (Engl. trans., 1907).

[2] The Evolution of Matter.

[3] Of course the question remains, What compressed the spring? If Matter and Motion are continually wasting, it follows that they must at some time have been originated, and that the power which originated them is not dependent on them.

resolved into the primordial Something from which it somehow originated. And where will the saint and the sage, or anything that we can recognize as life, be then?

The answer to all this rises to the mind at once when we abandon the point of view of the thermometer and place ourselves at that of rational Man. This Matter, on whose states life is supposed to be dependent, is, after all, known to us only through the fact that we are living to observe it. If it disappeared, no doubt we should cease to see it, and if it were transformed we should see it otherwise, but to make the life which sees dependent on our seeing anything exactly as it appears now on this globe is surely the wildest of assumptions. We observe that life makes use of certain conditions of matter—a certain range of temperature, the presence of certain minerals and gases—in order to express itself. We regard these conditions as the product of a Power which desires life and has produced them to obtain it. But there may be many other conditions too. All we can tell is that beyond certain physical limits our senses cannot perceive life or get responses from it. M. Le Dantec would, no doubt, treat as an illusion the belief that man can communicate with and be responded to by a Power, a Life, transcending that of which the senses inform us. I am, with the multitude of men, profoundly convinced that we can. But leaving this entirely aside, is it not evident that, even

as there are invisible rays in the spectrum which are now and then discovered by some unexpected chemical or electrical action, so there may be modes of living of which none of our present senses can give us the faintest conception? Whoever may deny this possibility, and on whatever grounds, it certainly cannot be denied on any grounds that physics or biology are aware of. And to those who believe that life is the central thing, and that matter exists only for it, the possibility is a certainty, for life must have been when as yet matter was not—life set it going. To convey the idea that everything that exists, however it may be transformed, is part of a divine Whole which cannot die because it is essential Life, we say that it is 'immortal,' and conceive ourselves as existing after death in a spiritual form just as the body exists after the bodily death in other bodily forms. Whether time and space, or even personality, will exist for us after death we dare not say; we are totally unable to imagine the conditions of such an existence. But we can perfectly grasp the broad fact that whatever we do and are, whatever we think, whatever transacts itself even in the unconscious sphere of our existence, must have eternal endurance and significance because it is knit with the eternal Whole.

"To the foot," says Epictetus, "I shall say that it is according to Nature that it be clean; but if you take it as a foot, and not as a solitary thing, it shall beseem it to go into the mud, and to tread on thorns, and perchance to be

cut off, for the sake of the whole; otherwise it is no longer a foot.

"And some such thing we should suppose about ourselves also. What art thou? A man. Look at thyself as a solitary creature, and it is according to Nature for thee to live to old age, to grow rich, and to keep good health. But if thou look upon thyself as a man, and as a part of a certain whole, for the sake of that whole it may become thee now to have sickness, now to sail the seas, and run into peril, now to suffer need, and perchance to die before thy time.

"Why, then, dost thou bear it hard? Knowest thou not that, as the foot, alone, is not a foot, *so thou, alone, art not a man.*"[1]

The broad fact on which a system of natural ethics must be based, if it is to have any ethical quality at all, is that *the individual life finds its goal in the cosmic life*, not in pleasure, or any other term by which we may choose to express a sensation of personal enjoyment. The distinction between the *bonum honestum* and the *bonum delectabile* is really a valid one—it is no invention of moralists "suckled in a creed outworn," but is revealed by a study of life and its manifestations to have been deeply rooted in nature from a period far anterior to the advent of man upon the earth. In man, the *bonum honestum* takes the form mainly of what Epictetus calls the sense of "natural fellowship"

[1] THE TEACHING OF EPICTETUS, p. 103. DISSERTATIONS, II, v, 24, etc.

among men, and what Christ expressed in the word which gave to the ideas of Stoicism the penetrating power they had lacked, the great and divine word, Love. But we must never forget that even this word will not take us to our end and sum up a system of ethical thought unless we rightly conceive the ultimate object to which it is directed. This is not the visible community of men, nor even that of all nature, now existing or to exist in the future. It is the ideal, eternal community, of which every man remains equally an organic part, whether he has any means of physical communication with his fellows or not. It is that without which the visible community, with all its laws and inter-relations, would never have come into being. It is the "city of God," builded without hands, the Universal Polity whose "troubled image," as Plato says, we discern in the polity we know.

When Socrates, after his sentence, lay in prison awaiting the summons to die, his friends gathered round him entreating him to make his escape, and explaining to him the safe and easy means they had provided for that end. Freely and cheerfully as was his wont, delighting in the play of dialectical fence, he debated the matter with them. Then he laid dialectics aside, and spoke to them from the heights of vision. Rightly or wrongly, he declared, the laws of his mother-city, to which he owed all he had and all he was, had bidden him die. Whatever happened

now, there could be no escape in the end. Some day he must face death, and stand before the Laws of the Underworld. What answer should he make to Them when they demanded how he had dealt in life by their brethren in the world above?

This grand impersonation of the eternal Laws in their kinship with the laws of the visible world illumines a whole region of thought, extending far beyond the limits of the particular moral question which evoked it. It strikes the note of all high thinking on man's duty to man. The laws, written or unwritten, that govern societies of men can claim no reverence from the individual who does not feel that they are the shadows or copies of laws belonging to the sphere of the eternal.

It is one thing to admit that the social relations of mankind give the start to ethical feeling, provide it with a wide and varied field of action, and with a criterion as to what is right and what is not. It is quite another to argue that this ethical feeling is merely a product of these relations, and has, apart from them, no meaning or purpose. This is another case of the principle which I have described before[1] in speaking of Evolution and Involution. Without both of these I cannot see how any movement from one state of being to another is to be accounted for. People, or even animals, living in communities find that mutual aid is useful to them, and they practise it. The utili-

[1] See pp. 186, 187.

tarian school think, when they have demonstrated this, that the whole ethical question is solved. But in reality they have not even approached it. Mutual aid is useful? Well, then, it is useful. How are we going to get any further? How are we going to account for love, duty, fidelity, self-sacrifice? Because certain things appear in the world under certain conditions we have, many of us, got into a slipshod way of saying that they are the product of these conditions, but a strict examination of the terms will frequently show that they are nothing of the kind. There is no valid reason why social life and mutual aid should not go on for ever without producing anything higher than the sense of mutual advantage. The nobler passions do indeed come into life when the proper stage of social evolution has been reached, but their source is not within the bounds of the visible order, nor do I see how they can ever justify themselves with reference to it alone. Neither, on the other hand, can they be realized without it. The divine air which we breathe on the mountain height is not made by the mountain, but we must climb the mountain to breathe it. Every step we take upwards in the visible order is, as it were, the discovery of something in that invisible order which is its spiritual counterpart and gives it its spiritual significance.

I have said that ethics is for life; but to the individual it must sometimes appear to be rather for

death than for life, unless he knows that there is a life beyond the visible life. In this faith only—in whatever varied forms the intellect of man has embodied and expressed it—are martyrdoms possible. And martyrdoms have been so often the great turning-points and inspirations of human history that an ethics which cannot justify them would seem to be an ethics at odds with nature. Consider from our point of view the significance of the two martyrdoms of history which have most deeply impressed and influenced the minds of men.

Socrates had no gospel, no new truth to proclaim. He dissociated himself from the 'rationalistic' theories of his time, not indeed because he was particularly attached to ancient ideas in religion, but because theorizing on these subjects had no interest for him.[1] On his trial he expressly disclaimed heretical views on religion. It is clear that these were only charged against him because the real offence was no crime in Athenian or any other law. The real offence was that Socrates was a relentless critic, within reach of whose tongue no patriotic rhetorician could feel himself confident and comfortable. It was a time of rhetorical patriotism in Athens. From the bitter humiliation of the Peloponnesian War had arisen an impulse towards national regeneration, a genuine and worthy impulse in itself, but one which unfortunately took shape not

[1] See, *e.g.*, the opening of the PHÆDRUS.

in a manly facing of facts, a courageous march forward to the future, but rather in a panic-stricken retreat to old conservative formulas and bigotries, to the abandonment of which by cultivated Athenians was ascribed all the evil that had fallen on the city. Socrates, however, delighted in taking popular convictions and reducing them by a series of ingenious interrogations to their verifiable residuum of truth, if there happened to be any. They commonly emerged from the ordeal in a dilapidated condition. At a time when the whole city was high strung with patriotic fervour while inwardly very uncertain about its principles of action, the presence of a thinker like Socrates, with his pitiless arraignment of every gaudy fallacy before the bar of Reason, was a continual scandal and offence, and was easily interpreted as a public danger. Had he consented to keep silent, and affected to fall in with the general trend of public sentiment, he would, as he well knew, have been safe. But he refused all compliance and compromise, and declared with absolute truth that Athens would do better to reward him for stinging it into a perception of realities than to punish him for the wholesome pain of the process. So he went with clear-sighted deliberation to his death, and that death, so wonderfully recorded for us by the greatest prose writer of all time, has ennobled all criticism, all sceptical thought, thenceforward. None can think lightly of what Socrates thought it worth his while to die for.

Turn to the death of Christ, and into how different an atmosphere we seem to pass! No philosopher has here recorded for us the death of a philosopher. Myth and legend have clustered round the great event—the Jewish conception of an expiatory sacrifice—the truer and profounder myth of a slain and re-arisen God—and these have wrapped the Crucifixion in such a cloud of mystical light and colour that the outlines of the historical fact are lost to view. When this cloud is pierced, however, an intelligible human transaction remains. In Christ the luminous purity of Greek reason was so blended with the religious fervour of the Eastern mind that he may justly be called the ideal man, the Son of Man and of God, the incarnation of the divine thought. Unlike Socrates, he was distinctly a heretic in his place and time. He appeared among a people deeply religious but one in whom religion had taken the form of an immense fabric of ceremonial and observance, guarded and administered by a special caste who conceived themselves as the appointed vehicle of the will of God for the untaught multitude. To this multitude Christ went direct. He led them straight to the ancient founts of light and life, disregarding the narrow channels hewn by Pharisaic formalism. He bade them open their eyes and see for themselves; he taught them that the truth was for all men; beside the conceptions of the authorized religion he set new conceptions which made the

old seem barren or ludicrous. The people heard him gladly, and the great fabric of Pharisaism was manifestly tottering. The fury of a monopolist caste was aroused. There is no more merciless anger than the anger of the religious monopolist who sees his monopoly threatened, and to this anger Christ fell a victim. As Socrates died for the right to disbelieve, so Christ died for the right to believe, and whatever the churches have made of him he has inspired every revolt against priestcraft and authority ever since. No creed is worth living for which is not worth dying for. Christ's death and spiritual resurrection[1] set the seal on this truth and gave the world the most signal instance in history of triumph arising out of defeat and death.

Volumes of argument and analysis could not confute an ethical system so effectually and so severely as the bare fact that it looked paltry or incongruous beside such lives and deaths as these.

The conclusions we have reached in this discussion of the basis of a natural ethics may now be summed up. We have interpreted the object of phenomenal Being as Life.

The ethical quality of life lies in its conscious and active harmony with the Whole.

[1] For a discussion of this subject I may refer the reader to an article by the writer in the *Hibbert Journal* for April, 1906: 'The Resurrection: A Layman's Dialogue.'

The motive for ethical action lies in the fact that we are a part of that Whole. The sense of this relation is as deep a part of man's nature as the sense of his selfhood, or deeper.

To live for Others, then, is no more the true epitome of a natural ethics than is, to live for Self. The true epitome is, Live for the Whole—the Whole which includes both others and yourself, which is greater than all humanity, yet is capable of being faithfully served in the silence of one human breast.

We have now before us, therefore, a clear conception of the criterion and the sanction of ethical action. The criterion is applied when we ask of anything done by man, "Does it further life in the Whole?" The sanction is found in the fact that each of us is an organic part of that Whole. The richest and fullest life is evidently to be won by the most complete development of all our faculties which is allowed us by our opportunities. Ethics, therefore, exists for life, not life for ethics. This simple proposition arises inevitably from the scientific conception of the world. The greatest of fallacies is to conceive life as existing for any other object whatsoever, or to define its aim as something more or less remote from our present existence. Our 'eternal life' is not something to come—we are living it here and now. This is not a pilgrimage or a place of preparation; it leads us to no heaven, no hell, no distant judgment seat. We are before

that judgment seat every hour; the heaven and the hell which it dispenses are the daily experiences through which we move; and the saints and prophets of this faith are those who have felt most deeply and revealed most profoundly the great realities of existence, hidden from us not so much by the darkness of the grave as by the impalpable veils of use and wont. The grave has mystery indeed but no terror of gloom for those who realize that the universe is but an eddy on the stream of life. By that eddy we see the stream, we feel its power and movement; and we know that the substance of which it is made is the stuff of life itself.

PART III: ART

CHAPTER X

ART AND LIFE

"Like a living thing, one and whole."—ARISTOTLE.[1]

THE third chapter of Tolstoy's book, WHAT IS ART? contains a summary of the opinions of some sixty modern writers (taken chiefly from Schasler's KRITISCHE GESCHICHTE DER AESTHETIK) on the essential meaning of the terms Art and Beauty. All these opinions, after having been duly paraded across the stage, are dismissed by Tolstoy as a mass of "enchanted confusion and contradictoriness," and he then proceeds to build up his own theory of art. As the latest critical treatment of the subject on a large scale by a thinker and an artist who has made a deep impression on the minds of men, his conclusions deserve careful attention on the part of any later writer who desires to deal with the perennially attractive but very obscure problems of æsthetics. Let me begin by quoting

[1] ὥσπερ ζῷον ἓν ὅλον. POETICS, XXIII, 1. He is speaking of the design of a narrative poem.

the passage with which Tolstoy closes the fourth chapter of his work :—

"To the question What is this Art, to which is offered up the labour of millions, the very lives of men, and even morality itself? we have extracted replies from the existing æsthetics which amount to this—that the aim of art is beauty, that beauty is recognized by the enjoyment it gives, and that artistic enjoyment is a good and important thing because it *is* enjoyment. In a word, that enjoyment is good because it is enjoyment. Thus, what is considered the definition of art is no definition at all, but only a shuffle to justify existing art. Therefore, however strange it may seem to say so, in spite of the mountains of books written about art, no exact definition of art has been constructed. And the reason of this is that the conception of art has been based on the conception of beauty."[1]

Now in one point at least, that which is embodied in the last sentence, these words of Tolstoy's appear to me to go straight to the mark. Art can no more be founded on beauty than morality can be founded on pleasure. A greater than Tolstoy has spoken the same truth in a couple of his mighty lines. The great masters, says Whitman,

> . . . do not seek beauty, they are sought,
> Forever touching them or close upon them follows beauty,
> longing, fain, love-sick.

But let us see what Tolstoy would set up in place of what he throws down. Art, he tells us, is "one of

[1] WHAT IS ART?, by Leo Tolstoy. English translation by Aylmer Maude, pp. 44–5.

the means of intercourse between man and man." "By words a man transmits his thoughts to another, by means of art he transmits his feelings." But the transmission must, if it is art, be intentional, premeditated. "Art begins when one person with the object of joining another or others to himself in one and the same feeling expresses that feeling by certain external indications." The "indications" may, of course, be a certain kind of language, or gesture, or plastic representation, or sound. If, by such means, a man has succeeded in making his own feeling *infectious*, and affecting others by it, he has, to that extent achieved art. Art is therefore "a means of union among men, joining them together in the same feelings, and is indispensable for the life and progress towards well-being of individuals and of humanity."[1]

Certainly one cannot but admire the strong clear-headedness and common sense with which Tolstoy blows away the mists into which he had plunged us in his third chapter, and brings us into a region of daylight realities, with firm earth under our feet. Undoubtedly if man does want to get into real contact with his fellow-men he must not merely tell them what he feels, he must make them feel the same thing. And art, produced with "individuality, clearness and sincerity" has this property, to use Tolstoy's own term, of infectiousness. Moreover it is of

[1] WHAT IS ART?, chap. V.

enormous antiquity and has exceedingly primitive forms. There may have been art before there was speech—there was certainly art before there was writing, before there was anything remotely resembling intellectual culture or religion. The metaphysical definitions of Hegel, "The Idea shining through Matter," or of Knight, "The union of object and subject, the drawing forth from nature of that which is cognate to man," and of the rest of the sixty and odd philosophers, do, I think, look a little irrelevant when we think of the cave-man scratching his bit of mammoth ivory. But Tolstoy's account of the matter glows with reality. The cave-artist was struck with something in nature—the reindeer drinking at a pool, the mammoth swinging through the jungle—he longed to express it, to make others see. It can hardly be doubted that this was the origin of art *as art*.[1] I think it is its fundamental quality even now, though we must include among the objects rendered things not in external nature but in the artist's own imagination.

The questions then arise, What is it that the artist is trying to infect other people with? Is art quite indifferent to the nature of the feeling communicated? Is there any common feeling expressed by things apparently so diverse as a strain of music, a piece of

[1] I do not mean to exclude the possibility that man may have first learned his *capacity* for art by making signs intended for quite other purposes, such as identification of tribehood, etc.

pottery, a cathedral, a lyric, a statue, and a landscape painting?

Tolstoy does not overlook these questions; he has, in fact, a great deal to say about them. But here, in his analysis of the æsthetic faculty, the obsession with the exclusively ethical view of things which has so much impaired his own art seems to have led him on a false track. Having decided that infectiousness is the common quality of all art, he is struck with the fact that this quality varies very much in different works, and he uses it to obtain a scale of merit:—

> "Not only," he writes, "is infection a sure sign of art, but the degree of infectiousness is also the sole measure of excellence in art. The stronger the infection the better is the art, as art, speaking now apart from its subject matter, *i.e.* not considering the quality of the feelings it transmits."[1]

This statement is obviously meaningless unless you define the nature of the person who is to be infected. Infection is as much a matter of the mind infected as of the agent which infects. "The stronger the infection for such and such an audience . . ." is what we shall have to read. The audience must be a constant element if the definition is to convey any distinct meaning. Perceiving this, as so acute a mind could not fail to do,

[1] WHAT IS ART?, p. 153.

Tolstoy falls back on exactly the same criterion as that of Bishop Butler when he endeavoured to get a universal standard of right and wrong. Butler set up as final judge in these matters the "plain honest man."[1] You were to appeal to the unsophisticated conscience of this ideal being, and that ended the matter. So, with Tolstoy, you are to get the "unperverted" man who, like an animal, "unerringly finds what he needs."[2] Most people in our society, says Tolstoy, "are quite unable to distinguish a work of art from the grossest counterfeit." They like, or pretend to like, Beethoven better than a peasant folk-song! But the peasant's, *i.e.* the untaught, appreciation, which is merely bewildered by Beethoven, is right.[3] This, we ultimately find, simply means that the "plain honest man," as conceived by Tolstoy, is one who appreciates the *moral* contents of a work of art, provided that it has any, and that it has infection enough to get them into his mind. And Tolstoy (the art-critic) does not care about anything except these moral contents.

This is clear when he comes to deal with the element which he mentions above as having been omitted from his consideration of the comparative value of art-work, namely the quality of the feeling transmitted by the medium of art. Here he lays it down that the object of all art is to unite mankind,

[1] FIFTEEN SERMONS, III.
[2] WHAT IS ART?, p. 146. [3] *Ibid.*, p. 148.

and to make them feel at one with God and with each other.[1] This may pass very well if by uniting is meant enabling us to enter with sympathy into the life of man, and even of things that are not man. Even so a drawing by Nettleship can make us feel at one with a python or a tigress. But Tolstoy does not mean that. His uniting is a moral and practical idea based on the doctrine that combat, and everything that could lead to combat, is wrong. Ancient religious perceptions, he argues, confined the sense of unity to the tribe or nation, and art had to glorify solely the might or greatness of the people who produced it. Modern religion, on the contrary, takes account of all humanity without exception. "And therefore the feelings transmitted by the art of our time not only cannot coincide with the feelings transmitted by former art, but must run counter to them."[2] Only two kinds of art, according to Tolstoy, "can be considered good art in our time." These are first, "art transmitting feelings flowing from a religious perception of man's position in the world in relation to God and to his neighbours," and secondly, "art transmitting the simplest feelings of common life, but such, always, as are accessible to

[1] WHAT IS ART?, p. 163.

[2] *Ibid.*, p. 161. How wide of the mark all this is becomes clear when we think, for instance, of the sympathetic treatment of the Trojans in Homer, or the nobility of feeling about the Moors which runs through THE CID. A great art may glorify battle, but cant and fanaticism are hateful to it.

all men in the whole world—the art of common life—the art of a people—universal art."[1] As instances of these types of good modern art, Tolstoy gives his amazing list—Schiller's ROBBERS, LES MISÉRABLES, Dickens's and Dostoievsky's novels, UNCLE TOM'S CABIN, and ADAM BEDE. In painting we are to take as types of excellence "the drawing by Kramskoy (worth many of his finished pictures), showing a drawing-room with a balcony past which troops are marching in triumph on their return from the war. On the balcony stands a wet-nurse holding a baby and a boy. They are admiring the procession of the troops, but the mother, covering her face with a handkerchief, has fallen back on the sofa, sobbing." Or one may turn to "a picture by the French artist, Morlon, depicting a lifeboat hastening in a heavy storm to the relief of a steamer that is being wrecked."[2]

It is easy to make fun of this headlong descent to the level of the parish magazine, but it is not so easy to challenge the position from which Tolstoy deduces his criticisms of individual works, or to deny that he has again and again struck home with incomparable force against the factitious art so current in the present day. His book is a piece of genuine thinking, and in this it has few rivals among contemporary works of æsthetic criticism, especially in English. Most of these works are either pæans of

[1] WHAT IS ART?, p. 166. [2] *Ibid.*, p. 167.

praise for what the critic finds attractive and stimulating to his own temperament, or attacks conducted with every resource of satire and ridicule on what he does not understand or care for. But a serious attempt like that of Tolstoy to discover and to apply a true principle of art criticism is very much to seek; and I venture to think that many critics who are horrified at the notion of putting UNCLE TOM'S CABIN above KING LEAR would find it by no means so easy as they suppose to give a rational account of the faith that is in them. Tolstoy's conclusions, like those of Plato in THE REPUBLIC (which they very much resemble), are wrong-headed, but his manner of thinking is that of a massive and nobly ordered intellect, and is well worthy of respectful imitation at whatever distance lesser powers can contrive to follow it.

I know nothing whatever (I regret to say) about the art of Kramskoy or of Morlon, but one imagines, from Tolstoy's way of talking about the works referred to, that they are attempts to capture admiration for a work of art by the aid of something which is not art, but sentiment. At any rate, that is just what Tolstoy desires them to do. Is art, then, entirely indifferent to subject, as some of the philosophers of the Impressionist school contend? Not at all—so long as the subject is something *in the picture*, and capable of being expressed in the medium of that branch of art. A crew of men pulling a boat through

a heavy sea may be a good subject for a painting, but to the artist it does not matter a pin's point whether they are going to rescue life or to board an enemy or to catch lobsters. Under the circumstances they will all look just the same. The wreck in the offing has its value in the design of the picture, no more and no less. And those who are always on the look out for false values, sentimental values, will never learn what art really has to teach them, what art alone can teach. What is this?

The master key with which we have tried to open certain doors in biology and in ethics will, I hope, serve us also in discovering the principles of art. I accept fully Tolstoy's postulate of infectiousness as a primary quality of art. There can be no art which does not communicate to others the feeling of the artist. This implies that the artist must have a distinct and sincere feeling to communicate. But it does not at all imply that the finest art is that which is most widely or powerfully communicable at its first appearance or at any given period in history. To say that infectiousness is an essential characteristic of art is not the same thing as to say that the more it infects, either extensively or intensively, the better art it is. One might as well say that if, as has been done, you define man as 'a political animal,' it would follow that the more strenuously political he was the more he fulfilled the purpose

of his being as a man. But politics and art are both of them simply ways in which man endeavours to remould his universe "nearer to the heart's desire." How does he make use of political methods *for his true purpose?* How does he make use of art and its infectiousness *for his true purpose?* These are the real, the decisive questions.

What is the essential thing communicated in art? The question is answered at once if we reflect that as life can have no ulterior object beyond life, and is satisfied when the maximum of living is attained,[1] so life must be the ultimate object of art also. It is the *quality* of art to communicate feeling; it is the *object* of art to communicate a feeling for life. *Art is man's expression of life;* and he delights in art precisely because and in so far as he delights in life. But if this be all, it may be objected, why, with life in full glow and activity all around him, should man turn to this reflection or rendering of it which he calls art? What place does the reality leave for the enjoyment of the shadow? This was substantially Plato's indictment of art in the last book of THE REPUBLIC. All things exist, according to his well-known doctrine of ideas, in an ideal or archetypal form, a "pattern laid up in heaven." There is such a pattern, let us say, of a Bed, and this is the real, the archetypal Bed. Copying some reflection of this in his own mind, the carpenter makes a material, individual bed.

[1] As, of course, it never can be in Time.

Then comes in the painter, who copies the bed of the carpenter, and who is thus at two removes from Reality; art, in Plato's view, being simply imitation, and therefore somewhat despicable.[1]

There are some minor, yet by no means trivial, reasons which might be given in answer to this objection; as, for instance, that art enables one to assemble together in small compass the expressions of a great variety of life not to be directly enjoyed, save at wide intervals of time and place. But the primary and fundamental reasons are our main concern here.

In the first place, the material world around us, or such portion of it as we are able to perceive, is not, as it stands, a pure expression of life. Holding as we do with Cleanthes in his majestic Hymn to Zeus that

[1] It is very hard to understand why, when Athens was producing some of the greatest art of the world and the profoundest philosophic thought, the attempt to develop a philosophy of the arts should not have succeeded better than it did. Plato felt instinctively that he had entangled himself in a chain of false logic, and he appeals to Art to vindicate its truth, if it can. He would yield himself to its "enchantment" only too gladly were it not "a sin to betray what seems to us the cause of truth." But it never occurs to him that what the painter is really copying is not the carpenter's bed, but the heavenly. Aristotle, on the other hand, well knew that there is something creative about art. Witness his famous saying that "Poetry is both a more philosophic and a higher thing than History, since Poetry looks at things in a universal, History only in a particular aspect" (POETICS, IX, 3). He was, however, still too much under the control of the popular view of Art as Imitation to be able to see the full scope of his own principle. Thus, he excluded Architecture from the realm of Art because it did not imitate anything in nature.

all things redundant have their place in the Whole, and that in it all things ugly have their beauty and all things hateful their share of love,[1] it is still true that the world as we see it presents us with a pell-mell of varied forms—some mature and beautiful, some in process of transition, some in decay, some stationary, unchanging, dead. The inner harmony which holds them together is rarely perceptible in any one fragment of actual life. But the artist adds this harmony, this completeness ; his work, within its own limits, is a whole. He gives us something which nature cannot give. Taking some aspect of life which he wishes to convey by means of line, colour, or tone, he suppresses, alters, composes, emphasizes, till he has expressed his feeling in its purity, with everything immaterial left out and with the things essential to his conception lifted clearly into view. His work is therefore greater and more vital than nature, that is to say than any fragment of nature, for he is looking at the part he renders *sub specie aeternitatis*, in the light of the Whole. And living in the conception of a great work of art, we live in the Whole ; the individual has sunk from view.

Zola has finely said, "Art is a bit of Nature seen through the medium of a temperament." This temperament means the artist's personal way of seeing life ; it means all that makes his art different

[1] ἀλλὰ Σὺ καὶ τὰ περισσὰ ἐπίστασαι ἄρτια θεῖναι,
καὶ κοσμεῖς τὰ ἄκοσμα, καὶ οὐ φίλα Σοὶ φίλα ἐστίν.

from a mere record. And the audience who see or hear his work become acquainted with this temperament—there is no other way in which the artist can express it so well. The artist, then, is giving us himself along with his subject, and this is the greatest thing he can give. Whether the wars of Troy ever happened is of very little consequence compared with Homer's way of imagining them. And when we have learned Homer's way we can and do apply it for ourselves, for has he not 'infected' us with it? The artist opens our eyes, and leaves us in a world infinitely more significant and beautiful than without his aid we should ever have known it to be. His function is thus the liberation within us of faculties, of powers of living, which otherwise might never have risen into consciousness. We commonly call this 'idealizing the facts of life.' It would be nearer the mark to say that it makes them real. Art turns our formal, sensible, external perceptions of things into real and vital perceptions, and thus enormously increases the range and volume of life of which those who apprehend it are capable. The glory of light, the music of winds and waters, the dignity of man's common occupations, the wonder and sweetness of the love of men and women, all these have been revealed to us by the artist, "a man speaking to men . . . pleased with his own passions and volitions, who rejoices more than other men in the spirit of life that is within him." [1]

[1] Preface to Wordsworth's LYRICAL BALLADS.

The essential purpose of any art-work, then, is to be *expressive of life*—more expressive than the raw facts of life ever can be. The practical problem for every artist in every kind of material is how to make his work expressive; only thus can it be what Tolstoy calls "infectious." To do this, besides the acquirement of technique, he must clearly have something to express. Let us not imagine, however, as the "plain honest man" is apt to do, that this must necessarily be something capable of being put into terms of the intellect—a fact, a story, a "criticism of life." Art is rather an exploration than a criticism of life.[1] And life is very great and manifold. Primarily the painter is a man who likes to apprehend life in colour, the sculptor one who apprehends it in

[1] "I have not been afraid of the charge of obscurity," says Walt Whitman, "in either of my two volumes, because human thought, poetry or melody, must leave dim escapes and outlets—must possess a certain fluid, aerial character, akin to Space itself, obscure to those of little or no imagination, but indispensable to the highest purposes. Poetic style, when address'd to the Soul, is less definite form, outline, sculpture, and becomes vista, music, half-tints, and even less than half-tints. True, it may be architecture; but again it may be the forest wild-wood, or the best effects thereof, at twilight, the waving oaks and cedars in the wind; and the impalpable odour" (Preface to TWO RIVULETS, p. 13).

Let me set beside this a passage from that singularly beautiful book, Kakasu Okakura's IDEALS OF THE EAST: "Shakaku in the fifth century lays down six canons of pictorial art; in which the idea of the depicting of Nature falls into a third place, subservient to two other main principles. The first of these is 'the Life-movement of the Spirit through the Rhythm of Things.' For art is to him the great Mood of the Universe, moving hither and thither amidst those harmonic laws of matter which are Rhythm" (p. 52).

the form of masses, the musician in sound, the poet in actions, emotions, ideas. Each may, and probably must, have some of the gifts and faculties of the others, but as painter, musician, or whatever he may be, he thinks and feels in the material of his own art, and he uses that material to express its own virtues, not to imitate those of another.

The question of the relation of art to beauty, and the meaning of beauty itself, may now be considered. What is this mysterious element about the nature of which such a torrent of opinion has been poured out since man first began to reflect on his own states of mind? Between the view which holds it to be an absolute and ultimate principle, recognized in, rather than arising from, experience, and that which denies it any right to be called a principle at all, referring it simply to the effect of habit, and refusing to see any essential difference between the Hottentot conception of beauty and the Greek, we can find, I think, a position in strict accordance both with the historical facts of the evolution of the conception and with the claims of the Idealists.

Let us look back a moment to the analysis of moral action which we made in the preceding chapters. We found then that while all healthy action tends to maintain and promote life, there are circumstances under which this life-promoting quality comes more saliently into view than is usual. This happens in

general when mere personal desires are subjected to the larger life of the Whole, or when a lower form of living is subjected to a higher. This heightening and intensification of life-promoting action we called moral action. And we drew no sharp and distinct line between it and ordinary healthy action, for nature knows no such distinctions, and the philosophy which tries to establish them is stamped with unreality.

In regard to Beauty we have only to take up the same point of view as we did in regard to Ethics, and the mystery lies clear before us at once. All nature is in some sense expressive of life, even when it seems most desolate or most degraded ; for life as we know it means change, variety, contrast, and, under the conditions of space and time, one can no more have life without death and decay than one can have height without depth. But all nature does not equally express life, and much of it, as we have seen, does not express it at all to our perceptions. Beauty arises, then, when we find a certain heightening, a saliency, an intensity in the expression or vitality, whether by external nature or, in art, by man. Thus Life, not Beauty, is the mark of art, but beauty is the signal that the mark has been hit.

As with the moral, so with the æsthetic sense—we find it in all stages of development. A man or a race whose range of life is contracted to a few physical enjoyments and pains will set the idea of beauty in whatever expresses or is associated with these enjoy-

ments. A wider, loftier, subtler conception of life will bring forth a nobler beauty. We are not, on this theory, abandoned to a mere subjective and arbitrary preference, according as we are trained and accustomed to this type or to that. There is a perfectly valid and objective criterion in the question, Which represents the fullest and strongest life? The Greek ideal surpasses the Hottentot—to take two extremes—because the Greek is capable of all that the Hottentot can do or feel—he takes it all up into his larger life; but the Hottentot can only live in a small sector of the sphere occupied by the Greek. Instead, therefore, of the two opposing battlecries of 'Art for Morals' and 'Art for Art,' let us set that of 'Art for Life.' For Life is greater than either art or morals; it includes and justifies them both.

The characteristics of Beauty will be further discussed in connexion with some of the individual arts, which we have now to range under our general principle.

The more deeply life is studied and felt, the more strongly do two great and cardinal principles of it come into view. These are opposed to each other, but complementary; and thus life in general appears to exhibit that singular quality of polarity which seems so intimately to pervade all its separate manifestations; everything which lives and moves appearing to do so by virtue of the action of two

opposing forces. These two poles of the axis of life are, on the one hand, what we call Order, Continuity, Rhythm; and on the other, Change, Variety, Contrast. If Order were not, Change would become chaos. If Change were not, Order would become death. In neither case would growth and development be possible.

An art, therefore, however abstract, like Music or like the decorative pattern in a Celtic MS., which expressed the union of these two principles might be profoundly expressive of life. It need not set before us any definite living thing provided it expresses the cardinal principles of all life. It will do this the better the more intimately these principles are blended, as in nature, into a vital unity.

On the other hand, art does, of course, frequently represent individual objects, and probably had its first distinguishable beginnings in so doing.[1] We may, then, get a broad classification of the arts by placing on one side those which deal with objects of sense, and on the other those which convey life under forms devised by the artist himself, and not found in the external world. One is tempted to call these respectively Imitative and Creative. But, after all, what is essentially artistic in the first category is just the fact that it is *not* purely imitative, for, as Mr.

[1] I may refer in passing to the researches of A. C. Haddon and Henry Balfour, who have made it seem at least highly probable that all decorative forms originated in the copying of natural objects.

Whistler observed, to suppose that you can get art by copying nature is equivalent to thinking that you can get music by sitting on the piano. On the other hand, it does not seem fitting to use so exalted a word as creation with reference to the pattern which a Zuñi Indian draws on a piece of pottery, while denying it to a painting by Titian. Instead, therefore, of using the words Creative and Imitative—now that we know what we mean by them—we shall contrast those arts which are directly Presentative with those which are Representative. In the one case the artist presents us with the whole artistic product, form and substance, as devised by himself. In the other, he represents to us forms already presented by nature, but re-composed, re-presented, and harmonized by him for an æsthetic purpose.

The Presentative arts fall into two classes. In one of these Music stands alone. Here the artistic purpose is not only dominant but (I speak, of course, of music in its highest and most characteristic development) there is no other purpose whatever. The forms elaborated by combinations and sequences of sound have no object except that of art and mean nothing apart from that. Hence Music has been called 'pure style.' We shall recur to this subject when we have dealt with the other class, that of the Decorative arts, the essence of which it is to add an expression of rhythm, of world-harmony, to

objects whose primary purpose is something different—a building, a vase, a piece of furniture, or a hanging. This class, again, can be sub-divided into arts which attain this effect by the structure of the object, and those which do so by the application of ornament to its surface; both being, of course, often combined in the same object.

In structure the expression of life is gained by so arranging the lines and masses as to give an impression that power is at work—that something is being done—done triumphantly yet not without strain and effort. Every object of utility does something—art shows it to us in the act. An example may help to make clear what I mean, and may show how the principle can be applied to any kind of object which may be the subject of artistic treatment.

A Greek temple in its simplest external aspect consists of a quadrilateral group of columns surrounding a walled shrine and supporting a low-pitched roof. Nothing could well be simpler than the structural conditions thus expressed. But the artistic expression of them is not so simple. This depends in the main upon the proportion observed between the pillars and the weight, or apparent weight, above them. If the pillars are too massive or too numerous there will be no sense of strain, and if they are too slender or too few there will be no sense of security. In either case the expression of vital energy in the structure will be imperfect, and beauty, which waits

on the golden moment of the perfect adaptation of means to ends, will not dwell in that structure. There is nothing more inartistic than superfluity; and there is no lesson more emphatically taught by nature than this. The avoidance of insufficiency is generally enforced in practice on utilitarian grounds, but its artistic justification is equally evident. The golden mean is what we call Just Proportion.

The kind of vitality expressed in Greek architecture is quite different from that expressed in Gothic, but the æsthetic basis of both styles is the same; the principle we have in view will justify any art in which there is the spirit of life. A Greek temple shows us power, braced and conscious, but in repose. There is nothing daring or sensational in its construction. Stress and thrust answer each other directly, simply, massively. The stately calm of such a structure might easily become dull and monotonous were it not for the delicate sense of proportion governing the relations of the parts, for the introduction of slight deviations from strict rectangularity and symmetry,[1] and for the beautiful decoration in form and colour on frieze, pediment, and capital.

[1] F. C. Penrose showed in 1851 that all the quasi-horizontal lines in the Parthenon are really arcs of circles, that the 'entasis' or swelling of every pillar is the true arc of an hyperbola, and that there is not a true right-angle nor a strictly vertical column in the building. All good Greek buildings are similarly full of "curves, leaning faces, irregular spacings, and other optical refinements" (INVESTIG. OF THE PRINCS. OF ATHENIAN ARCHITECTURE). This principle, called by

The principle of the arch was known in very early times to Pelasgians in Greece and to Etruscans in Italy, both of whom, no doubt, derived it from the East. But it was valued more for its utility in certain constructions than for its artistic quality, and Greek classical architecture knows nothing of it. It was freely used in Rome, and here its extraordinary effect of vital energy as a supporter of weight first began to be perceived. When Romanesque and Gothic architecture seized on this principle, the strength of stonework, heretofore essentially placid, leapt into vehement life and action. A Gothic cathedral is the expression of a war of mighty forces held in equilibrium by their own antagonism. Every part seems to threaten destruction to some other. There is, of course, a war of forces in a Greek temple also, but there the weight and thrust answer each other, as we have said, directly; a vertical column supports a horizontal architrave, and *must* support it, for nothing can give way without crumbling to pieces. In Gothic building the counter-stresses meet indirectly, a dead weight or a thrust is met by the springing curve of an arch; the whole structure would fall to ruin were it not for something in the stone which is not mere solidity, which arises from something vital and energetic in the scheme of the structure. The expres-

Ruskin 'life' (SEVEN LAMPS) and by some 'symmetrophobia,' was most daringly applied in mediæval building. A very striking and well illustrated series of articles on the subject was contributed by Mr. W. H. Goodyear to the *Architectural Record*, Vol. VI, 1896–7.

sion of conflict, therefore, as compared with Greek architecture, is greatly intensified; the serenity of power has given place to the play of forces rushing into eager and often tempestuous action, and saved from being mutually destructive by the control of a far-seeing design.[1]

To treat fully the various ways in which structure may be made expressive of life would need a volume rather than a chapter. Enough has however been said to indicate the principle and to suggest a criterion by which good and bad structure may be judged. Let us turn to the question of ornament. In European art it is very common for ornament to be used as a kind of adjunct to structure; it follows the lines of structure and accentuates them. In Japanese art, however, the contours of an object often appear to determine the ornament applied to it as little as a window-frame determines the landscape we see through it. The apparent insouciance of Japanese ornament is, however, carefully calculated in relation to the field which is to be covered. In either case ornament as such—that is to say, apart from whatever charm of colour and rhythm its individual forms may have—is to be interpreted as an attempt to give life by introducing what is so characteristic of life—the element of change and variety. Popular language

[1] I am indebted in connexion with these remarks on Gothic architecture to a very interesting paper by Mr. L. March Phillipps in the *Contemporary Review* for September, 1907.

has hit the mark when it talks of a 'dead' wall, meaning thereby a wall whose surface is unbroken by openings or ornament. Ruskin has somewhere spoken of the magnificent work of Ghiberti on the bronze doors of the Baptistery in Florence as having been primarily designed to produce "a pleasant bossiness of surface." The breaking up of the surface will not, however, be pleasant unless the forms of the decoration are in themselves good and instinct with life.

The beauty which so often arises from the effects of use and exposure may perhaps seem in some cases hard to reconcile with the principle which it is here sought to establish. If aptness for use, it may be asked, is an element in the beauty of an object of use, how are we to account for the strong appeal which the ruin of a noble building certainly makes to the sense of beauty? For my own part I am inclined to think that the taste for ruins is often a sign of a want of taste for art. A beautiful thing is better whole and sound than in decay. Yet the spectacle of the silent struggle of strength and grace with destructive forces has in it a sense of action, of drama, to which beauty cannot be denied. Apart from the question of actual decay, every one feels the æsthetic gain which has been made when a thing ceases to be blankly new. A natural adornment has then been added to it. A room that has been lived in, a piece of silver that has been rubbed

and handled for a lifetime, the steps of an ancient building worn by thousands of passing feet, a wall whose angles are softened and whose surface is stained by having fronted the sun and rain for many years—all these have the natural and inimitable charm produced by the touch of life—they no longer stand in crude isolation, they are related to the goings-on of the world.

Of all the arts there is none which seems to evade analysis so much as Music; none whose power is at once so mighty and so mysterious. Saying nothing it seems to mean everything. We can think of nothing in the world so lofty, so sweet, so profound as to be the fit embodiment of what Music conveys to us. Closely analogous in its outward form to what in line and colour is called Pattern, we are yet evidently far short of expressing the whole character of Music when we say, what in itself is quite true, that it is beautiful pattern in sound. It has more of humanity about it than pattern can have. It neither gives us representations of objects of sense, nor even definite emotions, but it has a unique power over the moods of the soul. This power seems to arise first from its complete control over the resources of movement and rhythm, secondly from the fact that by virtue of certain acoustic laws it can excite the sense of fulfilment, of suspense, of unexpected sweetness, unexpected failure and depression, in a way open to

no other art which appeals directly to the senses. But rhythm and movement are the main things in Music, and the nature of the power which it exercises by means of them must now be considered.

Rhythm and movement are closely related to each other, but they are not quite the same thing. The term rhythm is given to any kind of movement which is marked by the regular recurrence of stresses, undulations, beats. This is the essential character of the movement of life. Action and re-action, systole and diastole, the vibrations of the atom, the breaking of sea-waves, the changes of day and night, the alternations of the seasons—wherever we look, into things great or small, we find the same principle of rhythmic movement pervading all. Man has found out how to turn this principle to account in his mechanical contrivances, indeed in all ways in which he endeavours to exercise force on matter. Once get your force to work rhythmically, and it will do ten times the work it is capable of when evenly continuous. Our own bodies and nervous systems are attuned to the same law. Under the spell of rhythm the mind is capable of moods and emotions which without it could never have been evoked into consciousness. And that makes the difference between telling a thing in verse and in prose. Verse arouses the mood in which the subject has emotional value and significance. Even prose always becomes more or less rhythmic when impassioned.

Now Music has a control unrivalled among the arts over this element of rhythm. Other arts can suggest rhythm, Music actually *is* rhythm—it is the very pulse of life. It can produce rhythm, moreover, in a great variety of ways. The mere succession of sounds is rhythm, but music also has at command the varying stresses or accents of notes, alternations in volume of sound, alternations in pitch and quality of sound. And since a sequence of notes will cling to the memory, Music can put into rhythmical relations, not only single notes, but groups of notes, *i.e.* musical phrases, and chords, which are musical phrases played all at once. Music can therefore not only thunder upon the brain with mighty shocks of sound, but can enchant it with the most delicate complexities. The range of its power over rhythm is incomparably greater and subtler than that of the only two other arts in which rhythm works directly on the senses—dancing and metrical verse.

The element of beauty in a rhythmical phrase seems to depend mainly on the kind of mood it awakens. There are moods of meditation, moods of tenderness, moods of ardour, moods of yearning, moods of gaiety—all these and many more are under the control of rhythmic phrases. And there are common-place, self-assertive, bouncing rhythms which produce corresponding moods, and which may therefore be called ugly. The precise connexion of certain phrases with certain moods depending, as it

does, on a world of dim associations stretching far beyond our personal, conscious life, is probably incapable of scientific statement. In the last result I think we should find that the characters of different rhythms are associated with bodily movements, attitudes, gestures, in short with dancing; but a host of other associations, branching out from this in many directions, have introduced a complexity of meaning which defies analysis.

To turn to the consideration of Movement in art, we find that the power of rendering this characteristic of life is shared by Music only with Dancing and with Literature. By movement in an art-work I mean movement whose sequences have proportion and design, progressing by stages linked to each other through natural and organic associations towards a significant conclusion. In nature, movement can be immensely varied in character. It can be slow or swift, rough and laboured or smooth and fluent, massive and voluminous or arrowy and intense; it can leap or undulate, march or dance, soar or swoop, and each of these kinds of movement means something to the spirit of man. All these Music controls, and can order and harmonize at will. It can represent that in the movement of nature which goes beyond and overmasters Rhythm; for Rhythm in itself does not involve Progression; in fact, a perfect rhythm would forbid it. If Action and Reaction were always precisely equal, we should have a uni-

verse as stationary as a spinning top—it might be in vehement action, but it would never develop into something new.[1] Music by its complete command of the phases of movement can illustrate the progressive force, the life-impulse in nature, and this not merely by symbols and intellectual forms, but by playing directly on the nervous system as a harp-player on the strings of his instrument.

No art is more sensuous than Music, and none more abstract, more removed from what are called realities, in the substance of what it conveys. Its entire independence of objects of sense as given in experience, combined with its mastery of the inner law, the spiritual significance, of life has led to its being ranked by some as the highest of the arts. I doubt if such comparisons are profitable, but it is easy to recognize a sense in which Schopenhauer speaks truth when he says that the other arts deal with the shadows of life, Music, however, with its essence.[2]

Let us now consider the Representative Arts in the light of the principle which we are trying to establish. Since they depend on the portrayal of

[1] For example, when molecules first grouped themselves (supposing that was how it came about) into the form which resulted in living protoplasm, their action was one of a chemico-physical nature, but the response is not expressible in purely chemico-physical terms. Similarly when sensation first appeared in protoplasm.

[2] DIE WELT ALS WILLE UND VORSTELLUNG, Drittes Buch, *Die Platonische Idee das Objekt der Kunst.*

objects actually found in nature and not created by the artist, their relation to life is obvious. There are, however, some minor problems of great interest and intricacy connected with them, and these we must briefly touch on.

A great school of artists and art critics has in recent times maintained that Painting is concerned with nothing except harmonies of light and colour, and that subject is therefore completely indifferent to it save in so far as it affords opportunity for the rendering of surfaces variously illuminated and composed. The sun falling on a heap of refuse is on this theory as much to the artist as when it lights up the features of Cordelia under her tragic fate. A champion of this, as it is called, Impressionist school has explained its particular point of view by suggesting the manner in which two painters, one of the older type and one an Impressionist, would treat such a subject as the death of Agamemnon. The former would think of the magnitude of the event and the greatness of the characters of those concerned in it —the Impressionist would probably try to fix the attention of the spectator on some note of colour such as the red robe which a character in the scene might be wearing.[1] Can we judge between these

[1] Camille Mauclair, French Impressionists. "Light," writes M. Mauclair, "becomes the sole subject of the picture; the interest of the object upon which it plays is secondary. Painting thus conceived becomes a purely optic art" (p. 32). "The principal person in a picture," said Manet, "is the light" (p. 42).

rival conceptions of the function of the representative arts?

Let us revert to our formula—Art is the expression of Life. In the Representative Arts it is the expression of visible life. If one wishes to paint the death of Agamemnon it will not do to rely for one's effect upon the spectator's knowledge of that bit of Greek history and to make one's art impressive simply because its allusions are freely recognizable. So far undoubtedly the Impressionists are right. But on the other hand, the assassination of a great man is a bit of life and a very notable and memorable one. The visible world is, after all, not entirely summed up in the texture of surfaces under light. Character and spirit have also their visible manifestations, and the painter who can render them, as well as the aspects of physical life by which they are accompanied, is surely cutting a wider swathe of life than he who thinks only of the red robe of the actor in a tragic scene. Goethe satirized a whole false theory of art when he remarked in a well-known epigram that "pictures which work miracles are mostly very poor paintings." Yet one is reminded of his own feeling before the painting of St. Agatha, by Raphael, which he saw on his first Italian journey at Bologna. "I have marked this figure well," he writes. "I shall one day read my IPHIGENIA before her in spirit, and shall put no words in the mouth of my heroine which might not have been spoken by this saint." Was

there not something here for Goethe, for all of us, beyond painting for the sake of light and colour?

In considering the plastic arts in relation to subject, the large question of their function as illustration comes into view. An immense range of art, from that which deals with religion and history down to the drawings in our comic journals, evidently presupposes in the spectator's mind a background of information with which the work of art itself does not and cannot furnish him. A work of this kind must certainly be said to rely for part of its interest upon something which is not in the picture. It is therefore not a pure art product; it is a complex of artistic with historical or religious or critical interest; but so long as we do not confuse the different elements it would be absurd to say that they may not be legitimately united. Still, the subject of a picture, as a picture, remains always something which is in the picture. It would therefore be a contradiction in terms to speak of a poor picture on a great subject. If the painting be poor, the subject is poor—the painter's intention may have been great, but he has not expressed it. A reference to portraiture may help to make the matter clear. An indifferent portrait of a person held in special love or veneration by me would, if it were not so bad as to belie him, have an interest and value for me which it would entirely lack in the case of one who knew or cared nothing for the person represented. This superadded interest,

the interest which travels through the painting to some concrete person or thing behind it, must be thought away before a work of art can be judged as a work of art. The application to religious or historical art is obvious. Here is a painting in which an uninformed observer sees a woman and an angel. What is he to make of it? The painter is evidently representing a moment of great exaltation and significance. The woman is receiving a message; and the painter can tell us, within the limits of his art, not what the message is, but of what kind it is—sad, or solemn, or joyful, or tragic. He can make all the accessories of the theme, the lighting, colour, etc., reinforce his conception, and the observer can discern, if he has intelligence in such things, that the painter is putting before us his conception of the way in which a soul conceives a mighty destiny. *That is the subject;* the universal idea, although the label on the frame be 'The Annunciation.'

I hope it will not be thought that I am in any degree seeking to disparage the beautiful art of the Impressionists in maintaining that the highest art is that in which there is most of life. Life is so abundant and rich that one can find it almost anywhere in sufficient measure to delight and to enchant. Moreover, the great laws by which life acts and endures, the laws of rhythm, contrast, harmony, can be amply suggested in the plastic arts even when dealing with the most familiar things of earth, and these exalt and glorify any theme.

I remember to have heard once of a visitor to an exhibition of paintings by—I need not name him—a certain well-known purveyor of sensuous religiosities, a kind of nineteenth-century Carlo Dolci. On entering he met two ladies passing out through the ante-room, which happened to be hung with landscapes by an artist whom I need not hesitate to name, Mr. Mark Fisher. One of them wished to pause over these. The other, who walked with wet eyes and flushed cheek, cried, "Trees, trees! Do you want me to look at trees after having had my soul uplifted?" This little anecdote will bear some thinking over. Can we call an art bad which has power to uplift the soul? But we have to ask, Was it really the art which did so, or the allusions in the art? And again, as in the case of Tolstoy and his canon of infectiousness, we must ask, What soul? It is difficult to imagine that the soul capable of being uplifted by the art of the painter in question would be very quick to recognize the signs of nobility and heroic passion in real life. To recognize that the trees of Mr. Mark Fisher might be worth many Martyrdoms would be at least a sound beginning of an artistic education.

Dancing, so far as it is an art, must be classed under the Representative Arts. Unlike most of these it can render movement; and its art is to display movements in a progressive and a rhythmic

sequence. It is sculpture in motion. Unless when combined with Music, however, its range of artistic expression is not great, beautiful effects are not under strict control, and in their rapid change the eye cannot properly take them in. The impression left by a succession of attitudes seems more confused and more transitory than that of a musical phrase.

The question of the place of Literature in the scheme is one of some difficulty. Unlike all the other arts, its subject matter is not brought directly before the senses, but evoked by conventional symbols which have in themselves no æsthetic value whatever. Thus in one sense it may be called the only strictly national art in existence. The most beautiful poem in the world, though it were graven in Egyptian basalt, would be a collection of meaningless scratches if the language in which it was written were lost. If, however, the language be known, Literature has not only the power of evoking the conceptions desired by the maker, but also that of working directly on the senses by means of the rhythmic qualities of speech. Still the range of rhythmic expression in language is so limited that in itself (*i.e.* as we might feel it if spoken in an unknown tongue) it may be regarded as quite subordinate to the matter conveyed. Strictly, therefore, we ought perhaps to call Literature neither a Presentative nor a Representative, but an Evocative art.

Within its own circle, however, it falls naturally into classes corresponding to those of the other arts, for narrative literature and drama, which deal with actions and images taken from external life, are clearly Representative in character, while lyrical and meditative poetry, which place the maker's mind, mood, or passion directly before us, are Presentative.

Literature has one great superiority over the plastic arts. Like Music, it can render the movement of life. In the dramatic form this movement can be brought to bear directly upon the senses. It resembles Painting and Sculpture in being able to deal with concrete objects of sense, though, as we have seen, its method of dealing with them is not strictly representative. It stands absolutely alone in the fact that it can render thoughts[1] as well as passions or moods. I should, then, be inclined to reckon Drama as the greatest of all the arts in its range of expression, while at the same time it cannot be claimed for it that it approaches Music in the control of moods or in the intensity of effect which audible rhythm alone seems to command. The conclusion drawn by Wagner, that the supreme art must be sought in a combination of Music and Drama, is a tempting one, but I doubt its validity. The question arises whether in this combination one or other of the united arts

[1] No one who has seen "Le Penseur," by Rodin, will doubt that plastic art can render Thought. But literature alone could tell us what he is thinking.

does not surrender much of its own special power. So at least one great poet seems to have felt. "C'est defendu," announced Victor Hugo about his dramas, "de mettre des notes de musique le long de ces vers." The poetic use of language has its own conventions and laws, and these, when used by a master, are so subtle and so powerful that to set his words to music is often to produce an effect of distortion. What is most truly poetic in the language is turned into an empty mask by withdrawing the underlying substance to place it under the control of another convention, another law. One can, no doubt, as in the case of a Greek chorus, set great poetry to the measure of a simple chant, or one can unite rhythmic diction of a broad and simple character with great music, but the highest poetry and the highest music do not seem to combine to good purpose.

In this rapid survey of the arts there are, of course, large and attractive fields of exploration which have not been even glanced at. It has been sought on the present occasion merely to give the clue by which the arts may be related to the main thesis of this book. Ethics and Art constitute the two great fields of what we may call the disinterested activity of man. They engage his highest powers, they set him on fire with ardour and sympathy, yet they do nothing, directly at least, towards satisfying the primary and personal needs of his nature. Our

problem has been to relate them to life, and to give them a place in a scheme of organic unity. Both have been seen to have that place only by reference to something which in one sense is immanent in nature, and clearly perceptible there, but which in another aspect is outside "the realm of clock-time and measuring rod," the transcendent Whole. All spiritual ethics, all art which is not of the nature of a mere record, must in the last resort rely on this wholeness of things for their justification. But in the earlier parts of this study we have tried to show that even the physical organization of nature must rely on it too; for the driving force of evolution, as well as the framework of law in which it works, have been both interpreted as a manifestation of the Will to live, to act; of the impulse towards the richest and fullest development of the material, animal, and spiritual life. It is in this life-impulse that God reveals Himself in the world of time and space. This is the visible aspect of His all-embracing unity; this is His essential relation to earthly things; and this is the clue to their rational interpretation as parts of a divine cosmic Order. To learn to apprehend the vast Purpose with conscious intelligence, to further it with conscious will and with deliberate faith, is the sweet and wholesome gospel which Nature preaches to all who have ears to hear.

APPENDIX A

SUM ERGO COGITO

NOT to encumber the text with too much abstruse metaphysics, I place here what seem to me some important corollaries of the position stated at the close of Chapter I.

If the Universe is not a mere aggregate but a coherent Whole, then it follows of necessity that the units which compose it will have relations not only with each other but also with the Whole. When any of these units reaches the stage of consciousness it may be expected that it will become conscious of these relations, and that this consciousness will, like other things, develop in time to greater and greater fulness.

But here, from the analytic side of the Kantian philosophy, comes the warning which tells us that all we can really know is the stream of sensation which passes through our mind and which derives the order and coherence it seems to possess from the laws of that mind. How can we transcend this apprehension of fleeting appearances, and attain knowledge of the One, the Real, and of our relations with It?

To answer this question we must look a little deeper into the basis of this doctrine of the subjectivity of human knowledge.

This subjectivity, when we examine it closely, does not

(as it is often, I think, supposed) appear to be a special and inexplicable condition imposed in some external way on human consciousness. It is a condition absolutely bound up with the state of existence implied in being a Person, an 'I.' The moment the mind is able to turn inward upon itself and to separate the thing known or felt from that which knows and feels, in that moment the Thing stands a whole infinity away from the 'I'; they are separated by the analytic faculty of the Ego and they can never *by that faculty* be reunited. The state of being an 'I' is essentially a state of analytic consciousness. The intuitions of space and time are simply the instruments by which the analytic faculty works, for it is only by their relations in space and time that things in the world can be divided and distinguished by the intellect. This analytic faculty has, it must be noted, an unbounded power of disintegration. It does not spare even the Ego itself, which it reduces to a mere flux of sensations. There is no answer to its destructive logic except the sufficient one, that this boundless power of analysis in both directions, inward and outward, is simply a function inevitably bound up with being an 'I' at all—it is because of that function that I am an 'I.' Every being possessing 'I'-hood must, *eo ipso*, be capable of reducing all external things to its own sensations, and of externalizing its own self. One cannot be an 'I' on any other terms.

Now let us suppose that this analytic faculty did not exist, and that consciousness went on, as perhaps it does in beasts, by acts of pure intuition, without ever turning inward to regard itself, without ever making distinctions between external objects, save as a matter of unreasoned sense-responsiveness; what would the consequences be then?

Clearly in that case object and subject would be one, and knowledge, *so far as it went*, would be absolute knowledge. But it would neither be true nor false, since without analysis and comparison there could be no criterion of truth and falsity. Nor, similarly, could the actions springing from this state of what may be called Impersonal Consciousness be either ethically good or bad in relation to the creature which performed them. In this state, things in space and time would be seen simply as they really are—as moments in the life of the Spirit.

Our relations with the Whole, then, must be sought in this region of pure impersonal consciousness, which implies entire forgetfulness of Self, entire surrender to the life-movement of the universe. We can understand now why man has always had yearnings for this state, and has so often sought to attain it by false means, by the trance or ecstasy produced through self-hypnotism, drugs, etc.; means ultimately and necessarily destructive of their object since a self-regarding motive lies at the root of them.

If there are illegitimate ways of attaining this state what, it may be asked, are the legitimate ones? The difficulty of this question lies in the fact that the state of impersonal consciousness disappears the moment we begin to think about it. We live in it, in fact, a great deal more than, in our states of analytic self-consciousness, we have any idea of. But as a rule we only live in it with a part of our nature—the instinctive, animal part. To enter it with our whole nature, to live in it as Man, two ways have been found and these we call the way of Religion and the way of Art; or, if we describe them by the faculties respectively dominant in each, as the way of Love and the way of Beauty. Through these essentially harmonizing and synthetizing powers Man can for a while merge himself in the

vast ocean of Being, and return from it, renewed and purified, to the narrow confines of his selfhood.

But return he must; for selfhood is not an accident or a deformity, not a thing to be despised and shuffled off the moment we can get rid of it. It, also, is a power of life, and through it we are enabled to harvest an immense store of experiences. Through the Ego, no doubt, with its rapacious egotisms, come sin and wrong into the world; but, as Heracleitus finely says, "Men would not have known the name of Justice if these things had not been." Moreover, man has to act as well as to be and to feel. For all complex action, regarding distant ends and involving choice and discrimination, the faculty of analysis, with which selfhood is bound up, is absolutely essential. Man is not to be raised in the scale of being by cutting away any part of his nature, but by developing the whole harmoniously; and the analytic self-consciousness is harmonized with the impersonal consciousness when the one is used to translate into its own sphere the experiences of the other—to fashion in the visible and material life some counterpart of the realities known in the spirit.

APPENDIX B

CO-OPERATION AND COMPETITION

IN Kropotkin's MUTUAL AID: A FACTOR IN EVOLUTION, it seems to me (for all that it finds little favour with some men of science) that real light has been thrown on certain principles of cardinal importance which had been obscured in the too exclusive contemplation of the Darwinian principle of the survival of the fittest in the struggle for life. Ample proof is given by Kropotkin of the truth of the following passage :—

"As soon as we study animals—not in laboratories and museums only, but in the forest and the prairie, in the steppe and the mountains—we at once perceive that though there is an immense amount of warfare and extermination going on amidst various species, and especially among various classes of animals, there is, at the same time, as much, or perhaps even more, of mutual support, mutual aid, and mutual defence amidst animals belonging to the same species, or, at least, to the same society. Sociability is as much a law of nature as mutual struggle. Of course it would be extremely difficult to estimate, however roughly, the relative numerical importance of both these series of facts. But if we resort to an indirect test, and ask Nature: 'Who are the fittest: those who are continually at war with each other, or those who support one another?' we at once see that those animals which

acquire habits of mutual aid are undoubtedly the fittest. They have more chances to survive, and they attain, in their respective classes, the highest development of intelligence and bodily organization. If the numberless facts which can be brought forward to support this view are taken into account, we may safely say that mutual aid is as much a law of animal life as mutual struggle, but that, as a factor of evolution, it most probably has a far greater importance, inasmuch as it favours the development of such habits and characters as ensure the maintenance and further development of the species, together with the greatest amount of welfare and enjoyment of life for the individual, with the least waste of energy" (pp. 5, 6. 1903).

From the mass of facts which Kropotkin has adduced in support of the above-quoted view, I cannot forbear quoting one, an observation of his own, relating to a creature of by no means high organization :—

"As to the big Molucca crab (*Limulus*), I was struck (in 1882, at the Brighton Aquarium) with the extent of mutual assistance which these clumsy animals are capable of bestowing upon a comrade in case of need. One of them had fallen upon its back in a corner of the tank, and its heavy, saucepan-like carapace prevented it from returning to its natural position, the more so as there was in the corner an iron bar which rendered the task still more difficult. Its comrades came to the rescue, and for one hour's time I watched how they endeavoured to help their fellow-prisoner. They came two at once, pushed their friend from beneath, and after strenuous efforts succeeded in lifting it upright; but then the iron bar would prevent them from achieving the work of rescue, and the crab would again fall heavily upon its back. After many attempts, one of the helpers would go in the depth of the

tank and bring two other crabs, which would begin with fresh forces the same pushing and lifting of their helpless comrade. We stayed in the Aquarium for more than two hours, and, when leaving, we again came to cast a glance upon the tank : the work of rescue still continued ! Since I saw that, I cannot refuse credit to the observation quoted by Dr. Erasmus Darwin, namely, that 'the common crab during the moulting season stations as sentinel an unmoulted or hard-shelled individual to prevent marine enemies from injuring moulted individuals in their unprotected state'" (pp. 10, 12).

APPENDIX C

IS LIFE WORTH LIVING?

THIS grave question is, according to Mr. Herbert Spencer, one which must be "definitely raised and answered before entering on any ethical discussion" (DATA OF ETHICS, § 9). He goes on to restate it in the form: Does life yield "a surplus of pleasurable feeling over painful feeling?" and he argues that "goodness or badness can be ascribed to acts which subserve life or hinder life only on this supposition" (§ 10). But can one really strike a balance between pleasures and pains in human life? Mr. Spencer himself admits, later on, that pleasures and pains, "unlike in their kinds, intensities and times of occurrence, are incommensurable" (§ 57). Moreover, the maintenance of life in the present day means passing it on for countless generations ahead, and how can we feel satisfied that the conditions then existing will make more for pleasure than for pain, even assuming that they do so now? The question, then, whether it is good to maintain life does not seem capable of philosophic decision on this ground.

Mr. Spencer's sense of logic, however, seems to me to be here at fault as well as his fundamental conception of ethics. The question which he begins by asking is not the question which he ends by answering. In the original question, Is life worth living? a comparison is set up between living and not-living. But we find this merging,

in Mr. Spencer's mind, into the quite different comparison of one *kind* of living with another kind of living—the pleasurable and the painful. Let us translate the original question into the language of Mr. Spencer's ethical system. In that system "the good is universally the pleasurable" (§ 10). The word 'worth,' then, connotes pleasure, and the question resolves itself simply into this, Is it more pleasurable to live than not to live? Seeing that in not-living there is no pleasure at all, the only possible answer is an affirmative—the question answers itself. And in fact this must always be the case whatever connotation we attach to the word 'worth,' for life has at any rate possibilities, whereas not-living has none. The question, then, "of late so much agitated," is really a nonsense question, and the reason why it is necessarily devoid of meaning will appear at once when we analyze the terms. For 'worth,' 'goodness,' 'blessedness,' 'pleasure,' and so forth, are simply *terms of life* and have no significance whatever apart from it. So the question, Is it better to live than not to live? is merely the same thing as to ask, Is there more life in living than in not living? Instead, therefore, of the unverifiable assumption on which Spencer bases his system of ethics, that life yields on the whole a surplus of pleasure over pain, we merely affirm the indubitable proposition that it yields a surplus of life.

From another side than that of the Spencerian ethics, however, it may be argued, against the conception which we are trying to substitute for it, that, if Life is something more than the physical phenomena attending it on earth, if, in fact, it is what we call 'immortal,' we need be at no pains to preserve it for ourselves or others in the form in which we find it going on here, since death can merely have the effect of translating it into another form.

True; but suppose us to hold as lightly by *that* form as we are urged to do by this—suppose us to show no persistence in *any* of the forms of being into which our life may pass, what kind of life would be realizable under such conditions of eternal volatility? Could life ever have risen above the stage of the *Amœba* if the *Amœba* had not the instinct to maintain itself on earth? Can Man ever hope to rise to anything higher without a strong element of continuity, of fixity, of 'fighting it out on these lines' in his feeling about the form of life in which he actually finds himself? It is through the thousand ties of duty and service, love and joy, which we form with the visible world around us that we realize the highest life of which we are at present capable. A light-minded readiness to snap those ties would imply an incapacity for forming them. Here, as always, we find that Nature tells us nothing to any good purpose unless we look at her as an organic whole. One cannot live by any isolated principle or factor, however great and true.

APPENDIX D

ST. FRANCIS THE POET

NO one can read St. Francis's one poem, the *Canticle of the Sun*, without feeling that had poetry claimed and won him in time, his might have been one of the greatest and sweetest of Italian voices. The story of its composition has a touching beauty. Towards the end of his life, when in the deepest dejection over the failure of his Order to live the life of joyful humility, unworldliness, and poverty to which he had pledged it, he came, blind and ill, to S. Clare's Convent at St. Damien, on his way to Rieti, where his malady was to be treated. In this darkest hour of his life the untroubled faith and loving sympathy of his old friend brought consolation and peace to his torn spirit. She made him, it is said, a cell of reeds in the convent garden, where he could be free to come and go as he wished. "Little by little," writes Paul Sabatier in his VIE DE S. FRANÇOIS, "the man of ancient days revived in him, and at times the Sisters heard the echo of strange chants, which mingled with the murmuring of the pines and olives, and which seemed to come from the cell of reeds." One day, after a long conversation with Clare, he had sat down at the monastery table for refection. Scarcely had he begun to eat when he fell into a kind of trance. "Praise be to God!" he cried, on coming to himself. He had completed the *Canticle of the Sun*.

It is said that for a week afterwards he forgot his breviary, and passed his days in repeating to himself the strophes of his wonderful poem—a work in which, for all its religious ardour, the note of asceticism is little apparent; unless one sees it in his usual quaint adoption of the things of creation into a religious community! I append a literal translation, omitting two later verses composed for special occasions and not belonging to the first pure inspiration. It is written in unrhymed irregular stanzas:—

CANTICLE OF THE SUN

Most high, all-powerful, good Lord,
thine are praises, glory, honour and all benediction.
To Thee alone, Most high, they are due,
and no man is worthy to name Thee.

Have praise, Lord, with all Thy creatures,
especially Brother my Lord the Sun.
He gives the day, and by him Thou showest light,
and he is beautiful and radiant, with great splendour.
Of Thee, Most High, he is the symbol.

Have praise, Lord, for Sister Moon and for the Stars;
in the sky Thou hast formed them, bright, precious and beautiful.

Have praise, Lord, for Brother Wind,
and for the Air and the Clouds, and for the clear sky, and for every kind of weather,
by which Thou givest sustenance to all Thy creatures.

Have praise, Lord, for Sister Water
who is so serviceable and humble and precious and chaste.

Have praise, Lord, for Brother Fire,
by whom Thou dost illuminate the night.
He is handsome and gay, bold and strong.

Have praise, Lord, for Sister our Mother, the Earth,
who nourishes and takes care of us,
and brings forth divers fruits with coloured flowers,
and the grass.

Praise ye and bless the Lord and render thanks to Him,
and serve Him with great humility!

APPENDIX E

ISABELLA AND CLAUDIO

THE ethics of sex-relations has always formed a crucial question in ethical systems. Let me recall a remarkable debate upon it which took place recently between a champion of the Spencerian system, Dr. Saleeby, and Mr. W. S. Lilly, who represented, of course, the view of Catholic orthodoxy.

Mr. Lilly, in an article on Shakespere's Religion contributed to the *Fortnightly Review* for June, 1904, was led to dwell on "the strikingly Catholic ethos of the play MEASURE FOR MEASURE, informed as it is by the idea, quite alien from the Protestant mind, of the surpassing excellence and sacrosanct character of virginal chastity." Hazlitt, whom Mr. Lilly takes to represent the typical Protestant view, had declared himself "not greatly enamoured" of Isabella's inflexible purity, and had expressed his want of "confidence in the virtue that is sublimely good at another's expense." Mr. Lilly added that Spencer's teaching would have countenanced Hazlitt's judgment and enjoined upon Isabella compliance with Angelo's desire. Dr. Saleeby having denounced this as an "outrageous" perversion of Spencer's meaning, Mr. Lilly vindicates himself in a letter to the *Fortnightly* as follows :—

"I pointed, in a letter appearing in your July number, to Mr. Spencer's express declaration, in the *Data of Ethics*, that the elements out of which the conceptions of right

and wrong are framed are pleasures and pains, and that 'conduct is considered by us as good or bad, according as its aggregate results to self or others, or both, are pleasurable or painful.' I concluded, therefore, that if we are to go by Mr. Spencer's 'scientific ethics,' Isabella ought to have been willing to make the sacrifice of her virginity in order to prevent the disagreeable feeling which would be caused to herself through the loss of a beloved brother, to Claudio through the process of decapitation, and to Angelo through disappointed desire, and thus to have procured, as 'aggregate results,' a great balance of pleasure over pain to all concerned" (*Fortnightly Review*, September, 1906).

Dr. Saleeby's answer to this is the obvious one that the Spencerian ethics do not contemplate immediate personal pleasures and pains, but rather ultimate utility to the race at large, and that "Isabella's virtue, if merely by example alone, would make for the strengthening of the society in which she found herself." Mr. Lilly then practically surrenders his first position—he admits that Spencer's "scientific ethics" are intended to have little or no concern with the immediate sensations of Isabella, Claudio, and Angelo, but he turns to confront Dr. Saleeby and Spencer from a new and much stronger position. What claim, he asks, have "scientific ethics" on the individual? Ultimate utility for the race might (if one could estimate it correctly) be taken as giving us the *what* of moral action, but can it ever give us the *why?* Isabella was not thinking of "ultimate utility" in her refusal, but of the laws that Sophocles wrote of so memorably, "unwritten and invincible laws which ever live, and no man knows their birthplace." She was not thinking of the effect of her example—her action would have been, and ought to have been, just the same though she had had the most complete assurance that

none but Angelo and herself would ever know the reason for Claudio's pardon. The motive which constrained her was derived from the system of ethics which Spencer's was constructed to replace. This new system has never succeeded in supplying an answer to the demand of the individual man or woman, 'What is the advantage of the race to me that I should sacrifice the least of my inclinations for its sake?' But till that piercing question is answered, all hedonistic systems, however elaborate and perfect their fabric, are building on "wood, hay, stubble." Touch their foundations with the pitiless edge of that question, and in a moment they are in the dust. So far, in effect, Mr. Lilly.

Before we go on to deal with these conflicting views of the ethical problem in MEASURE FOR MEASURE, let us take a parallel presentation in literature of the same problem, in which the implied judgment of the dramatist appears entirely different. Maeterlinck, in his MONNA VANNA, shows us a beautiful and high-souled woman, the loving and faithful wife of the commandant of the city of Pisa. The city is beleaguered by foes, its power of defence is at an end, an assault is imminent, and the inhabitants will be exposed to all the havoc and outrage which attended warfare in the days when the conceptions so much prized by Mr. Lilly held undisputed sway. The captain of the besieging Florentine forces, a great soldier of fortune named Prinzivalle, had been an ancient playmate of Monna Vanna, and, unknown to her, had been her ardent lover. Being entreated for mercy, he sends an ultimatum. Let Monna Vanna spend a night in his tent, and he will provision the city and withdraw his army next day. Amid the indignation and distraction which the cruel dilemma causes in the household of the prince, Monna Vanna's resolve shapes and hardens itself. She decides to sacrifice herself

for the city. But Prinzivalle finds her a woman of marble. Her soul is so high-strung with heroic devotion that she regards her body as little as a cast-off rag—she is become as incapable of fear or shrinking as she is of base desire. His passion is chilled by the icy completeness of her self-surrender, while all that is noble in him responds to her nobility, and the city is saved without the terrible sacrifice which she was ready to perform.

Such is the tale of Monna Vanna, so far as it concerns our present discussion. In reading it, it is impossible not to feel that she was right, just as in reading MEASURE FOR MEASURE it is impossible not to feel that Isabella was right. What has a system of natural ethics, a system based on the conception of life and nature put forward in this book, to say upon the searching ethical question involved in these two great dramas? It is not an easy nor a pleasant question to subject to philosophic analysis, but it is a very important and critical one.

In the first place neither science nor sense will, I think, agree with Mr. Lilly's estimate of "the surpassing excellence and sacrosanct character of virginal chastity." Virginity, *in itself* and apart from all qualifying circumstances, is the reverse of excellent and admirable. It means death, not life; it violates nature. What is really sound doctrine in this connexion is not the sanctity and excellence of virginity, but the deep degradation of making sexual relations a subject of barter. Wherever this prevails, whatever the church and the law may or may not have had to do with the transaction, the beauty and romance of life is blighted and destroyed. There is no conquest of culture which should be guarded more devotedly than the dignity and sweetness which are brought into the relations of man and woman by love, as the great poets have understood

that word, love moving in its guarded circle of mutual trust and intimacy. A life is well lost in defence of this most sacred treasure of the spirit.

Isabella and Monna Vanna both felt this truth in the depths of their nature as all good women do. Yet absolute laws of action can rarely, if ever, be laid down to cover every individual case. One can conceive either of them deciding as Monna Vanna actually did. But in the realm of high tragedy which we are now dealing with, where principles and actions have a simplicity and integrity rarely found in common life, it must be felt that neither of them could have taken up life again as if nothing had happened. Had they recognized that there were higher reasons stringent enough to compel them to tread the way to that sacrifice, they would, I think, like the Roman Lucretia, have solemnly marked it with their life-blood as an expiation, and as a warning, were it only to Prinzivalle or Angelo, that such a thing must not be done save at the most terrible cost that man can pay. For Isabella, then, the problem would practically resolve itself into the question whether she should surrender her own life for that of a single worthless relative. There was no moral obligation on her to do that. Had she loved him so intensely as to go willingly to her doom for his sake, no one could have blamed her; no one could blame her if she refused, and bade him summon up his manhood to die for his own sin.

But in Monna Vanna's case it was not a single life that was at stake, but the life and honour of a multitude of men and women with whose protection, moreover, she was, in part, charged by the high position she held in their midst. If right and wrong are to be interpreted as Mr. Lilly would interpret them, solely with regard to the arbitrary commands of a supernatural Power, then the *extent* to which a given

action may influence life can hardly be a matter of any moment. On the other hand, in Spencer's scheme, with its criterion of the greatest ultimate pleasure of the greatest number, hardly anything else can matter except precisely this question of the extent or area affected by our action. In the scheme of natural ethics which I am trying to commend, and which, if I am right, grows logically out of the conception of a living universe, the element of *extent* has its due place in determining action, but none in fixing the character of the action. And this, it may be observed, is just what the good sense of humanity has practically arrived at in its daily judgments and doings. No ordinary man would be required by any ethical law to lay down his life as a substitute for another who had no claim on him. But for a community, or a man such as a sovran, who for the time represents a community and embodies its interests, it would be thought base not to die if occasion demanded it. And so Monna Vanna might rightly feel herself constrained to do for her city what Isabella was in no way required to do for a brother, but the quality of the action would remain in each case the same, and the tragedy could have ended nobly only in the one stern way.

On the general question of the ordering of sex-relations, it needs no argument to show that the conditions fixed by nature forbid them, in the interests of life, to be casual and fleeting. On the other hand to require that, when these relations have once been entered into, no vices, no cruelty, no variance of any kind on either side would justify the dissolution of the connexion and the formation of a new one, is surely a superstitious exaggeration of a principle in itself right and sound. Probably the law and practice in England at the present day are as good a rough approximation to a sound marriage system as man has yet

devised; with, however, this large qualification, that cases of divorce when they come before the law should be heard *in camera.* The Anglo-Saxon has not yet got rid of all his superstitions, and his belief in salvation by publicity is distinctly one of them.

INDEX

When a subject is treated on more than one consecutive page, reference is usually made to the first page only.

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